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R. W. Raymond

ROSSITER WORTHINGTON RAYMOND

A MEMORIAL

PUBLISHED BY

The American Institute of
Mining and Metallurgical Engineers

T. A. HICKMAN

OFFICE OF THE SECRETARY
ENGINEERING SOCIETIES BUILDING
25 WEST 38TH STREET
NEW YORK, N. Y.



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AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS

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PREFACE

This memorial volume is meant to serve as a permanent record of the services rendered by Rossiter W. Raymond to the American Institute of Mining Engineers and to the mining profession. The description of the Memorial Service and the formal biography are reproduced from the official bulletin of the Institute. The volume would have been larger and more comprehensive if Dr. Raymond had not outlived three of his most distinguished contemporaries, Clarence King, James D. Bogue, and S. F. Emmons. Fortunately one of his oldest friends, Dr. Lyman Abbott, has added greatly to the value of this memorial by contributing an intimate account of his work for Plymouth Church. Mr. James F. Kemp, Professor of Geology in Columbia University, speaks for the geological branch of the mining profession, although he writes also on other phases of Dr. Raymond's life. Major Arthur S. Dwight, a nephew of the Doctor, represents the metallurgical branch of the profession in both its civil and military capacities. Mr. Charles W. Goodale, of the Anaconda Copper Mining Company, touches upon the litigation in which Dr. Raymond took a leading part. Capt. Robert W. Hunt has been twice president of the Institute and was one of Dr. Raymond's most valued colleagues. Dr. Henry M. Howe is Professor of Metallurgy in Columbia University and likewise an ex-president of the Institute. Mr. Alfred R. Bellinger is a grandson of Dr. Raymond; his contribution expresses the feelings of the young people for whom Dr. Raymond was ever willing to spend his time, his talent, and his love. To Mrs. Bellinger, Dr. Raymond's daughter, the reader will be grateful for a biographic sketch which suggests that the literary inheritance is subject to no Salic law. To her I am indebted for much wisely sympathetic and keenly intelligent assistance in the preparation of this volume.

T. A. PICKARD.

SAN FRANCISCO,
August 12, 1920.

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Biographies

Reminders

Reminders

Reminders

Reminders

Reminders

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Reminders

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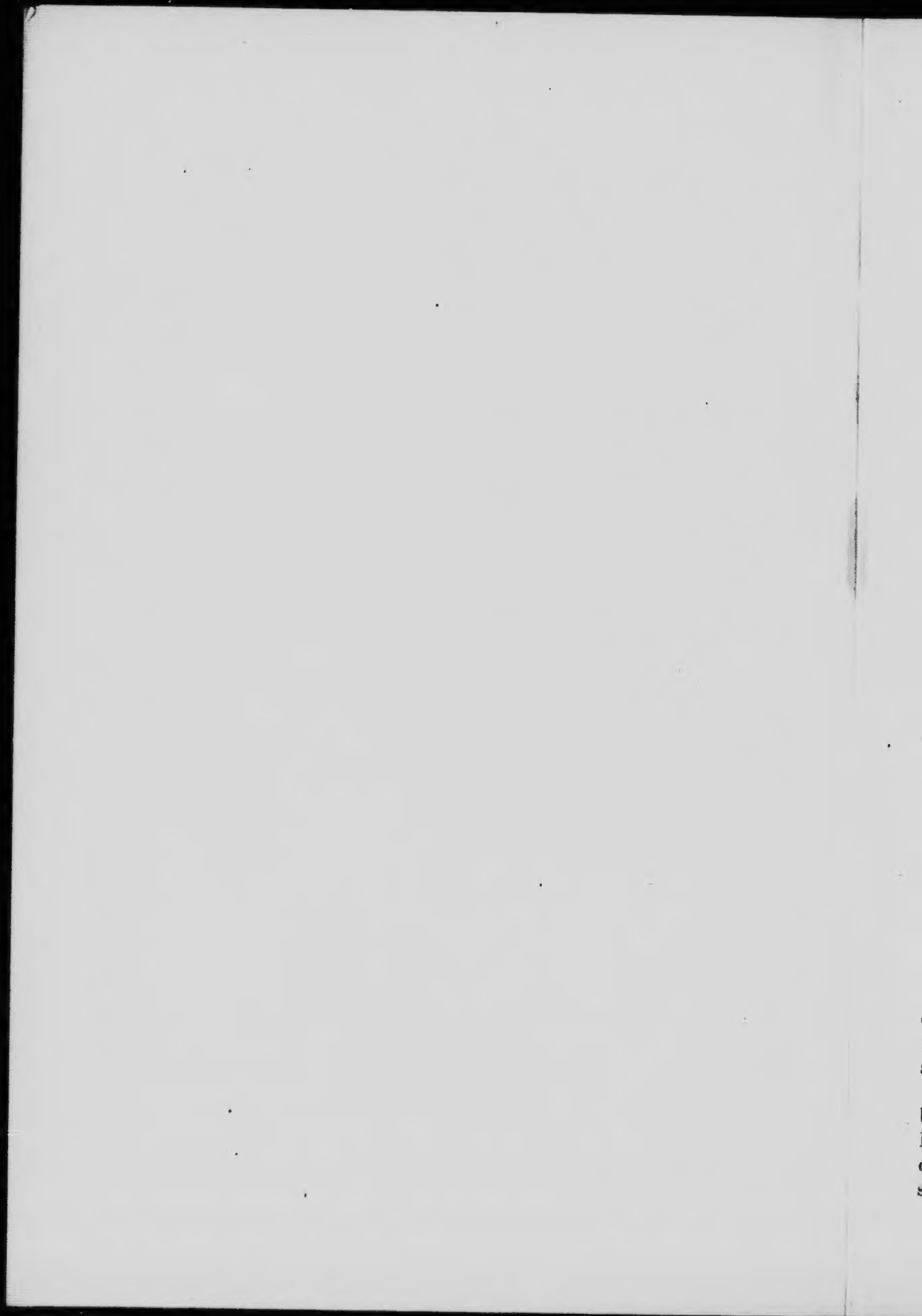
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Memorial Service to Dr. Rossiter W. Raymond

AT THE NEW YORK MEETING, FEBRUARY 17, 1919

All technical sessions were brought to an end in time for the members to gather in the Auditorium as the Institute paid its tribute to Dr. Rossiter W. Raymond. In opening this meeting, President Jennings said:

"We have gathered here to render our tribute of honor and affection to the memory of one who was for 47 years the guiding genius of this Institute. One of its founders, and at that early day one of the foremost in his profession, he saw it grow from infancy to the great body it is today. At the beginning, as now, its membership comprised the leaders in geology, mining, metallurgy, and technical education. Because so many were qualified to lead, and because ambition is an essential qualification for leadership, the most momentous of the problems coming before them for solution was the selection of the one to whom they could confide the care and direction of the institution which was to record their proceedings and to stand as an enduring monument of their accomplishments. Their decision would determine whether the members of this group of leaders were to be coöperators or competitors—associates with a common purpose or rivals for individual advancement.

"The selection of Rossiter Worthington Raymond for vice-president, president, and finally secretary; his retention in that office for 27 successive years; his elevation to the office of secretary emeritus and to honorary membership, constitute a testimonial greater than any honor that we can offer to his memory. In holding these exercises today, we simply voice our confirmation of the wisdom displayed by his colleagues in placing in his hands the guidance of their enterprise."

The following Resolutions, prepared by Dr. A. R. Ledoux and passed by the Directors, were then read:

"The Board of Directors of the American Institute of Mining Engineers would place upon its minutes its profound sense of loss and sorrow in the death of Rossiter Worthington Raymond, Ph.D., LL.D., secretary emeritus of the Institute. Both as one of its founders and as its secretary for 27 years, his was the guiding spirit of the Institute for more than a generation.

"During the greater part of this long period, it might almost have been said that the Institute was Dr. Raymond—and Dr. Raymond the Institute. When, with the progress of growth and development, great changes were introduced, Dr. Raymond acquiesced in these in spite of some misgivings, such as those with which a father might contemplate

the emergence of his child from the careful supervision of the home; but as secretary emeritus for the past eight years, he was always ready with valuable advice and helpful suggestion.

"His presence at the annual meetings was an inspiration, which his rare ability as a speaker further enhanced. Among the most versatile of men of genius, among the most distinguished as a mining engineer—a scholar, editor, and authority on mining law, yet to his personal friends he revealed a simplicity, a loyalty, and a steadfastness which held his intimates and bound them to him in spite of time and change.

"With his death there closes an epoch in the history of American mining and metallurgy. The Institute thereby loses one of its great leaders, but his example will live as an inspiration to those who survive, within its councils, and his name will be long an inspiration for many who knew him only through our Transactions and by his other writings."

Mr. T. A. Rickard was appointed editor for the Raymond memorial biographical volume.

Afterward, Dr. Henry S. Drinker, president of Lehigh University, and one of the two survivors of the 22 who attended the first session of the Institute, was introduced.

ADDRESS OF DR. DRINKER

A friend, whom we loved, has gone from among us. He was a man who by his genius dominated any assembly in which he stood. He was a teacher of teachers, a leader in all the many lines in which his energetic able personality led him.

Of his eminence as an engineer, and of his ability, learning, and surpassing power in argument and presentation as an expert and as a lawyer, I will not speak—the tributes paid him by Mr. Rickard and Mr. Ingalls are so well studied that they should stand as the record of our friend's professional reputation. He was a wonderful man in the absolute absence of pretense in all that he said and did. If Raymond said it you could rely it was so—and his mind was so encyclopedic—his learning so vast, that association with him was an education, intensive and broad.

It was my privilege to know him for a life-time. We were associated with the founding of our Institute at Wilkes-Barre in May, 1871. I was then a young fellow just stepping out into practice from college training under Rothwell in the Lehigh School of Mines, and Raymond and Rothwell, Coxe and Coryell, the men who organized the first coming together of the Institute, were men in the leadership of the profession, earnest, enthusiastic—early exponents of the profession they dignified and, in fact, introduced into this country.

From the beginning, Dr. Raymond's trained mind, inexhaustible energy, and wonderful aptitude of expression, enhanced by his personal charm of manner, meant everything in the early setting and development

of our Institute, which has grown into such a power in the engineering progress of our land.

We all pay tribute to Dr. Raymond's recognized ability and power of leadership—but there are today but few of us left who can personally turn and look back over a half century of actual association with him, a precious privilege filled with memories of a man of whom it may well be said, he was typical of "Whatsoever things are true, whatsoever things are honest, whatsoever things are just, whatsoever things are pure, whatsoever things are lovely, whatsoever things are of good report", for he was of virtue—and we may well, in thinking of him, think of these things. Dr. Raymond was generous in his encouragement and aid to younger men. I can personally, with all my heart, echo the words of Ingalls in his recent splendid tribute to Raymond where he speaks of having in his early association with the 'Engineering and Mining Journal' looked on Raymond as "a guide, philosopher, and friend"—trite words, but never more aptly, or better, or more truthfully applied.

Dr. Raymond's history has been recorded, and his engineering record has been and is being given by men far better fitted than I to do technical justice to so large a subject. It is for me as one of Raymond's many friends and admirers, one of his old friends, yet speaking from the standpoint of one younger than he and ever looking up to him as a leader and teacher, to pay tribute to his personal qualities that so endeared him to all who were privileged to know him. I owe a great personal debt to him for encouragement and aid to me as a young man, and I am moved to speak of it only as an instance of what was common to so many, for he was ever ready with counsel and cheering words of uplift and practical suggestion to the younger men who came under his observation, and in this he typified in person what our Institute has done as an association. Founded as it was by men of large heart and human sympathy, such as Raymond and Eckley B. Coxe, the Institute, particularly in its younger days when our membership was small, and the friendships engendered among members were intimate and common to all, did, and indeed has ever continued to do, a great work in giving to young engineers who came into its fold opportunity for betterment by association with older and eminent men, with an opening for the publication and discussion of their engineering experiences and theories. In the development of this practice, and as the able editor for many years of our Transactions, Dr. Raymond ever showed his kindly sympathetic helpful nature, and the men—and their number is legion—whom he so aided, pay tribute today to his memory with loving gratitude and appreciation.

He was a wonderful man in his faculty of doing so well so many different things.

Did his record rest only on his professional work as mining engineer, metallurgist, and mining lawyer, his friends might be content, but he

was not content with this. Dr. Hillis has told us in his beautiful tribute to our friend, of Dr. Raymond's leadership in religious work in Plymouth Church, and how after Mr. Beecher's death Dr. Raymond was asked to retire from his engineering and editorial work and take up the pastorate of Plymouth Church (and how beautifully his reply reflects Dr. Raymond in his sincerity, good judgment, and never-failing humor). Dr. Raymond said that the providence of God, through his fathers, had lent him certain gifts, and by His providence guided him into an appointed path; and now that his life journey had been two-thirds fulfilled, he did not believe that the Lord was going to return to the beginning of that path; and reverse Himself; and he would, therefore, follow the way appointed to the end of the road.

And in Plymouth Church and the friendships he made and cherished there, we can see how, while laboring for the good of his fellow-men, and for their souls' good, he yet rested from his professional work, and took pleasure and solace in his touch with the Church and Sunday-school in which his heart delighted.

His addresses in the Church, of which many have been published, show a vivid and ever-fresh and inspiring flood of wise helpful admonition and teaching—and his annual Christmas stories to the Sunday-school children—fifty in all, ending with the one given on Sunday, December 29th, only two days before his death on December 31st, are a unique and beautiful illustration of the faculty he possessed of using his great gifts for the young. The fiftieth and last of his Sunday-school addresses is as vivid in interest as its predecessors, among which those who read them can never forget the delicious talks chronicling the woodchuck who inhabited the Doctor's garden at Washington, Connecticut, and who is introduced with the words, "At our place in the country, where we spend five or six months of the year, we have, among other fascinating attractions, a woodchuck of our own. That is nothing very remarkable. The whole region is full of woodchucks, and the difficulty is *not* to have one.* * * Our garden is not far from his hole on the lawn, yet he never comes into the garden—for which reason we call him Maud, after the lady in Tennyson's poem. That lady did come into the garden; but then she was invited. If the gentleman had sung to her, 'Don't come into the garden, Maud', or even if he had never mentioned the garden, I am sure she would have stayed away politely, just as our Maud does,"—and then the address goes on with Raymond's never-ending sense of humor, deliciously emphasizing the wise words on current events and international politics that are voiced by the woodchuck in his conference with his host.

As Ingalls has well said, Dr. Raymond was one of the most remarkable cases of versatility that our country has ever seen—sailor, soldier, engineer, lawyer, orator, editor, novelist, story-teller, poet, biblical critic,

theologian, teacher, chess-player—he was superior in each capacity. What he did he always did well.

In his writings and poems his ever-present sense of humor shone out—and yet always there was an adumbration of wise reflection or suggestion—often a direct emphasis of advice on current questions of the day. In his wonderful story of 'The Man in the Moon', published over forty years ago, and doubtless reflecting some of his own personal experiences as an officer in the Civil War, Dr. Raymond recorded in his inimitable way what today may well be read as a prophetic utterance on the folly and the wickedness of the World War, in his account of the way that the opposing soldiers in the ranks came together on Christmas Day, and how a sentiment in favor of peace spread from the ranks to the peoples concerned until the generals in charge of the war, and the governing authorities of the countries concerned, awakened to the folly of the contention in which they had been striving and came together in a peaceful solution.

The story is an immortal one, and those of you who have not read it, have a great treat in store when you find it. 'The Man in the Moon —A War Story'.

Dr. Raymond's home-life was ideally beautiful and loving. On Christmas Day just passed this little poem—so characteristic of him, and so expressive of the love he bore Mrs. Raymond, accompanied his gift to her of a bond:

'Tis strange, Oh Lady! fair and fond
Of me (as likewise I of you)
That there should be another bond
Between us two!

You do not need this thing to make
Your life more full of hope and rest,
And yet sometimes you well might take
More interest!

And there is nothing better serves
For weary hearts and hands to droop on,
And stimulate exhausted nerves
Than a good coupon.

Dr. Raymond suffered a great sorrow in the loss of the son of whom he was so justly proud, a loss that he bore with a man's fortitude, and in which he was upheld by the faith and hope that his life so strikingly exemplified. That he should have been first taken, leaving here the wife to whom he devoted so many years of loving care, is a part of that great mystery into which we cannot look, but she at least has the comfort of the memory of her knight as one "without fear and without reproach"—a Bayard among warriors—a Sir Percival among knights.

Dr. Raymond belonged to many societies and his abilities received

due recognition in many honorary titles from societies, universities, and colleges. Among them it was the pleasure and honor of Lehigh University to confer on Dr. Raymond in June, 1906, the first Doctorate of Laws ever granted by the institution. When, in 1905, I was asked by my fellow alumni of Lehigh to lay aside my professional work and take on the responsibility of the presidency of Lehigh University, it was to Dr. Raymond I went for advice on my course. He urged me to take it up and during the years since then I have reason to be grateful for his steady counsel and support, and his visits to speak to our student body have ever been welcome and uplifting.

He, and our honored Dr. Drown, and I had a close and common bond in the association we all three had with Lehigh, and I know of no words more fittingly applicable to Dr. Raymond than those he spoke of Dr. Drown at the time we laid the foundation of Drown Memorial Hall on our Lehigh campus. Dr. Raymond said: "How well I remember that sunny afternoon at Philadelphia, when, in the sacred stillness of 'God's Acre', ringed with the noisy life of the metropolis, we buried in flowers and evergreens the body of our beloved friend, while overhead, branches, like these, waved their solemn murmurous benediction, and all around us white fingers pointed upward, mutely saying, 'He is not here; he is risen!'—and in our ears sounded that deep, dear message of the Spirit, chanting how the blessed dead rest from their labors, while their works do follow them!

"Methinks we do not always perceive the full meaning of that message. Too often we interpret it as saying, 'They depart; they cease from their labors; and the work they have done takes their place, as their only representation on earth, as all that is now left of their fruitful power'. Surely, this is not all. To rest is not to cease; to follow is not to remain behind forever separated from the leader, but rather to abide with the leader, though he be on the march.

"Our human experience is not without interpreting analogies. We know what it is to rest from our labors for a few happy summer weeks, laying upon other shoulders the daily burden and upon other hearts the daily anxiety, yet still in forest solitudes or up shining summits or by the boundless sea, carrying with us in a higher mood our work—weighing it more accurately, because we are not too tired; seeing it more clearly, because we are out of the dust of it; realizing its proportions and purpose, because distance gives us a perspective view; tasting its full sweetness, because its bitter cloudy precipitate has had time to settle; and renewing our high ambitions for it as we renew our strength for it. We rest from our labors, but our work goes with us, inseparably—only now we bear it, not as weight, but as wings.

"So, it seems to me, we are to think of our absent dead; they rest, but do not cease; they go on, and their work goes on with them. Indeed,

the interpretation is yet deeper. To my ears, the Spirit says 'Blessed are they who have labored so earnestly; to deserve the rest of a higher sphere of labor, and who have left behind them works which deserve to follow them, and to receive, even in that higher sphere, their continued remembrance and interest'."

How more fittingly can I close this tribute to the memory of our beloved friend than by these his own words, spoken of a friend dear to him, and honored by us all—words that today we may cite as a requiem and fitting thought of Rossiter W. Raymond himself, loved by us, whose name will go down in the annals of our Institute as that of a super-man of many parts to whom we owe much.

ADDRESS OF T. A. RICKARD

"Brethren"—it was thus that he addressed us on an occasion that many of you will remember: in 1893, at Chicago, at the closing session of the International Engineering Congress. Other men, representing other nations, had spoken—some of them in poor English—before he was called upon to reply for the arts of mining and metallurgy in America. When he said "Brethren", the audience was startled into lively attention, which was maintained throughout his speech; for then, as always, he knew how to reach the minds of men, and their hearts too. I remember his saying that those present had taken part in numerous scientific discussions; that they had evolved new ideas and had discovered new principles, but that they had done something much better: they had "discovered one another". So saying he put his finger on the distinctive feature of all such conventions. His mode of salutation also reminded those of us who were his personal friends that he was an evangelist as well as an engineer, and that he could instruct a bible-class in Job or St. Paul with the same power of exposition as he could deliver a lay sermon on mining or metallurgy. Indeed Rossiter Raymond was a deeply religious man, and no sympathetic understanding of his extraordinarily versatile character is possible without appreciating this fact. He was not only a prominent member of Plymouth Church, Brooklyn; he was superintendent of the Sunday-school for 25 years, he led in prayer-meeting and in bible-class, he interpreted the Old Testament during the period when the so-called higher criticism was undermining the faith of the churches, and he aided Henry Ward Beecher in steering his congregation through the storm of biblical exegesis that crossed the Atlantic forty years ago. The eminence that he attained as a religious teacher is measurable by the fact that when Beecher died the trustees asked him "to give up his work as editor, lawyer, and mining engineer, and take the pastorate of Plymouth Church", as recorded by the Rev. Dr. Dwight Hillis. He declined the honor, thinking it better "to give his life and strength to the vocation of an interpreter, chronicler, guide, and assistant to engineers, rather than

to that of a creative and constructive leader". I quote the words he himself used on the occasion of the dinner celebrating his 70th birthday.

Not many in the mining profession knew this phase of his character, although during his journeys through the West he would occasionally take the pulpit in some mining community and surprise a congregation that knew him only as the most distinguished of the experts engaged during the previous week in an important apex litigation. I have spoken of the part he played in the history of Plymouth Church, but his deeply religious nature was never so brought home to me as when his son Alfred died in 1901. He was a son of whom any father might feel proud; gifted and amiable, and on the threshold of a brilliant career. When he died Dr. Raymond proved, if it were necessary, the sincerity of his religious convictions, for his glad way of speaking of his departed son showed his confidence in a future union. I never saw a more convincing expression of the belief in immortality than in the attitude of Alfred Raymond's father and mother. It were improper for me, therefore, on this occasion to speak of the passing of our honored friend in a lugubrious strain. I shall speak of his life and career as an inspiring memory to be treasured as a heritage of our profession; and in doing so, I shall abstain from flattery. To extol the honored dead with honeyed words is an impertinence. Rossiter Raymond's career was so rich in performance as to require none of the insincerities of conventional biography.

To the profession, Dr. Raymond's work as secretary of the American Institute of Mining Engineers was the outstanding feature of his supremely useful life. When the Institute was founded, in 1871, he was elected vice-president, with the understanding that he would perform the duties of president, which David Thomas, by reason of his age, could not discharge. Thus from the beginning Raymond was the real president, and, on the resignation of Mr. Thomas, a few months later, he became president in name as well as in fact, thereafter to be elected again and again, until an amendment to the rules, proposed by himself, provided that no president could serve more than two years. Soon afterward, in 1884, he became secretary, a post that he held for 27 years—until his retirement from active service in 1911. He was secretary emeritus until the end.

The duties of the secretary included the editing of the Transactions. For this he was well prepared. He had been the writer of successive volumes of the 'Mining Statistics West of the Rocky Mountains'; he had been editor of the 'American Journal of Mining' for one year, in 1867, and for the seven following years the editor of its successor, the 'Engineering and Mining Journal', of which he continued to be associate editor with Richard P. Rothwell until they had a friendly disagreement over the 'silver question' in 1893, after which he withdrew from editorial responsibility, becoming a 'special contributor', in which capacity he

assisted the editors that succeeded Rothwell. Thus he took a notable part in the development of technical journalism in this country; but I regard his share in the early editing of the 'Journal' as important chiefly because it was a training for his life-work, that of secretary of the Institute. It is noteworthy that as the owner of the 'Journal' in its early days he found the work of writing and editing far more to his taste than the management, for in financial affairs he was too kindly to be a shrewd business-man.

As secretary of the Institute he performed divers duties; he invited written contributions and revised them before publication; he organized the meetings; he was the administrator. In course of time his ebullient personality so dominated the Institute that he was allowed a free hand to do as he thought fit. Presidents came and went; although nominally secretary, he exercised complete control. The personnel of the board of management, or 'council', of the Institute changed from year to year, but Dr. Raymond managed its affairs, practically without let or hindrance. The Institute became identified with him. For a period longer than a generation he was the mainspring of the activities of the Institute, its presiding genius, its chief spokesman. Those who participated in the meetings of ten or twenty years ago will retain a vivid impression of the way in which Dr. Raymond stamped his individuality on the organization. Courteous and friendly to all, resourceful and tactful in steering the discussions, witty and eloquent whenever he rose to his feet, he was the managing director of the proceedings; he gave point and distinction to them; he infused them with his keen enthusiasm; he lighted them with the brilliance of his mind. His versatility was unlimited. All knowledge was his patrimony and nothing human was alien to his understanding. Whatever the subject of a paper, he could add something to it; nay more, on many occasions when some new phase of geology or engineering was presented for discussion, he would rise to supplement the speaker's remarks and show himself so well informed on the subject as to eclipse the specialist. He did this not unkindly, but out of super-abundance of knowledge and sheer exuberance of spirit. On the other hand, no member engaged in preparing a paper for the Transactions failed to obtain his whole-hearted assistance in collecting the necessary data or in hunting for the needed references. When the member's manuscript arrived, the Doctor went through it with painstaking care. Before the use of the typewriting machine came into vogue, and even after, he would send letters in long-hand of as much as ten pages, explaining or suggesting improvements in the text. As a beneficiary of his conscientious industry, I can testify to the instruction in the art of writing that he gave to those who contributed to the Transactions. He was a delightful helper and a stimulating teacher. If any criticism is to be made, I venture to suggest that he over-edited; that is to say, the writings of the inexperienced

were so much revised as to be practically re-written by him. He would take the half-baked production of a semi-literate engineer and subject it to the warmth of his intellectual combustion until it emerged a wholesome biscuit. I recall a valuable metallurgical paper, written by a professor now recognized as an authority, that was so full of German idioms that Dr. Raymond had to re-write it. Shortly before the Colorado meeting of 1896 I persuaded a Cornish mining engineer to contribute a paper on the lode-structure of Cripple Creek. He was a keen observer, but a poor writer; when the paper arrived it was quite unsuitable for publication. Dr. Raymond showed it to me and said, "What am I to do with this?" I replied, "Don't accept it". "No", said he, "that would not be fair; we asked him to write it". "Yes", I said, "but I am responsible for asking him; let me lick it into shape." "No", he insisted, "that is my job, I'll see what I can do with it." He did, and he did it so thoroughly that my Cousin Jack friend obtained credit for an informing and well-written contribution to the Transactions. The result of such revision was to lessen the value of the paper as scientific evidence. The authenticity of the testimony, it seems to me, suffered by being given through the mouth of a skilled advocate. On the other hand, this overplus of editorial labor gave the Transactions a level of style that no other technical society could claim either then or since. All technical writing in the English language has felt, and long will continue to feel, the inspiration to excellence that he gave while editor of the reference library that we call the Transactions of the American Institute of Mining Engineers.

He left an enduring mark on the jurisprudence of mining. A keen observer and a clear expositor, he achieved distinction as an expert witness in the litigation arising from attempts to apply the law of the apex, a subject on which he wrote a series of essays that exercised a strong influence on the interpretation given by the highest courts to that Congressional statute. In the first big case in which he took part, the famous Eureka-Richmond lawsuit, he gave the term 'lode' a definition that not only swayed the decision in that controversy, but influenced all later mining litigation. On one occasion he was invited to address the United States Supreme Court on a point of mining law, and his exposition is said to have been accepted by the Court in its subsequent opinion. At that time he had not qualified as a lawyer, but in 1898 he was admitted to practise in both the State and the Federal courts. Five years later he was appointed lecturer on mining law at Columbia University.

As an expert witness, he was, as he said of Clarence King, approvingly, "an honest partisan". He used the gift of exposition with great effect when addressing the jury, under cover of giving evidence. I recall the explanation of the formation of mineral veins with which he began his testimony in the Montana-St. Louis case. Fortunate was the jury that had the opportunity of listening to such a fascinating lecturer. He was

not only an able witness-in-chief and extremely dexterous in circumventing cross-examination, but he was a great general. He was quick to recognize the important features of a case and skilful in marshalling his forces to the discomfiture of the enemy. In forensic duels he displayed characteristic wit and versatility. This legal practice was a source of honor and profit to him, but I venture to say that he helped geology more in other ways.

In 1868, when only 28 years of age, he was appointed U. S. Commissioner of Mining Statistics, and in that capacity he visited the mining districts of the West, which was then at the beginning of an era of widespread exploration. He was quick to appreciate the economic value of geology and to utilize the opportunities for study afforded by his official travels. In 1870, he was appointed lecturer on economic geology at Lafayette College, which appointment he held for twelve years.

When he became secretary of the Institute he transferred his keen interest in economic geology to the Transactions. As secretary, he persuaded the engineers to record observations made underground, and at the same time he induced the officers of the Geological Survey to present their scientific inductions to the Transactions in a form that rendered them attractive to the mining profession. Thus he brought the official geologist into touch with the mine-manager and consulting engineer, greatly to the advantage of all. He also did much to diminish the self-sufficiency of the Survey and to lessen the shyness of the so-called practical man. By his understanding of geology, his knowledge of Western mining conditions, and the zest with which he pursued the application of geology to mining, he aided greatly in exciting intelligent interest in the genesis of ore deposits. The Posepny volume proves that; so does the volume dedicated to the memory of his friend Emmons. In 1893, he translated Posepny's treatise from the German into his own vigorous English, and organized a discussion that enhanced the value of the original paper. By means of another treatise, by Van Hise, presented to the Institute seven years later, in 1900, he gave a fresh impetus to the study of ore deposits, the general result being to make the mining geologists of this country the leaders in a branch of study in which European scientists had theretofore held pre-eminence.

On his skill as a writer it is pleasant to dwell. He wrote out of the fulness of a rich mind, an alert imagination, and an abundant vocabulary, aided by the knowledge of several modern languages. He knew not only how to select *le mot juste*, but also how to weave words into ingenious phrases and to construct balanced sentences, following each other in logical order within well-proportioned paragraphs. He liked to number his paragraphs, in order to emphasize successive points at issue. He wrote with pen or pencil, usually the former, because it was less rigid and therefore less fatiguing to the fingers. He did not like to dictate any-

thing except ordinary correspondence, but he could dictate a long article or legal testimony, punctuation included, with remarkable clearness and continuity. He wrote easily, with all the joy of the practised hand and the disciplined brain. He twitted one of his contributors with having "an inveterate fluent profuseness of speech" and the happy victim protested that the phrase exactly fitted *him*, not the lesser writer. He was fluent and profuse, but not to redundancy or verbosity; on the contrary, his style was marked by force and consecutiveness, and, not infrequently, by those "saber thrusts of Saxon speech" that are the delight of the critical.

His literary ability was partly inherited from his father, Robert Raikes Raymond, who was editor successively of the 'Free Democrat' and the 'Evening Chronicle' at Syracuse, New York, from 1852 to 1854, and later professor of English in the Brooklyn Polytechnic Institute and principal of the Boston School of Oratory. It is also a safe surmise that Rossiter Raymond owed much of his fine feeling for the language of Shakespeare to his daily draughts from that well of English undefiled, the King James version of the Bible. There is no better schooling in our language than familiarity with The Book. A third aid to the cultivation of a good prose style was his frequent exercise in versification. The expression of simple ideas in verse by means of short words is excellent training for the effective construction of logical sentences in prose; moreover, the sense of rhythm incites assonance. On his return from life at the German universities, he brought with him many old folk-songs and student-songs, some of which he adapted to Sunday-school use. Thousands of children sang his hymns with delight because he knew how to present pretty thoughts in simple guise. That he could write serious poetry we know; for example, the lines to the Grand Canyon engraved on the silver tray that formed part of the gift presented to him on his 70th birthday. He wrote merry rhymes for our Institute meetings and for other occasions of a similar kind, making good-natured fun for himself and his friends. This playing with words in rhyme and rhythm gave him facility of expression in the more serious business of prose, and also in public speaking.

He was a delightful speaker. Our profession has never had a more eloquent spokesman. He seemed as little at a loss for ideas as for words; his enunciation was clear, he had a resonant voice, and his gestures were natural. Owing to his retentive memory and easy delivery, it was difficult to distinguish a speech that he had written from one that was extempore.

At any gathering he was individual—a distinguished figure. The wearing of a black silk cap and an old-fashioned way of trimming his beard gave him a striking appearance. Clear eyes, wide apart, an aquiline nose, and a square chin indicated imagination, perception, and de-

termination. His military training had taught him to stand upright. His pose was that of a captain of men. When he made a humorous hit he would tilt his head and smile, as if eager to share the fun with his audience. He never touched anything without giving it human interest. He found

"Tongues in trees, books in the running brooks,
Sermons in stones, and good in everything."

Rossiter Raymond exercised an immense influence in his day and generation—nay more, two generations felt the force of his personality. How he stimulated his religious co-workers has been recorded by the successors of Henry Ward Beecher. Both Lyman Abbott and Dwight Hillis have testified to the courage that he imparted to them during the troublous times of Plymouth Church. To the geologists who broke the trail for the scientific investigations of a later day he was a guide, philosopher, and friend. Such men as Clarence King, James D. Hague, and S. F. Emmons have recorded their gratitude for his support and advice. Among his engineering contemporaries were scores to whom he was an ever-ready source of information, a wise counselor, a cheery friend—for them he did many unselfish and kindly things. To those of us who were young when he was at his prime he was the very embodiment of scientific attainments. We looked up to him as the exemplar of effective writing and polished speaking, the pattern of engineering culture, the leader in everything that concerned the welfare of our profession. As secretary of the Institute we found him a lovable man, full of natural kindness and that helpfulness, without condensation, which the young appreciate so keenly when shown by a senior whom they admire. We—for I was one of them—found him an inspiring leader and a loyal friend. Loyalty—yes, that was one of his qualities. It got him into trouble more than once, for in friendship, as in apex litigation, he was unmistakably partisan. He stuck to his friends through thick and thin; he gave them the benefit of the doubt if they did wrong; he championed them when they were set upon. Lucky was the man on whose side he fought.

He was pre-eminently a publicist and an educator; he declined the pastorate of Plymouth Church to become the pastor of a bigger congregation; he resigned his professorship at Lafayette to be a teacher in a bigger school; he was the dean of the mining profession in the United States. For fifty years the force of his personality was felt among the men that were organizing and directing the mining industry of a continent; for fifty years he did not fail to write a Christmas story for the children of his Sunday-school; he was a friend to the old and to the young. Age could not wither him nor custom stale his infinite variety. He influenced those that today are influencing others; his spirit still moves among men. Blessed be his memory.

Brief Biography of Dr. Raymond

Rossiter Worthington Raymond, Ph.D., LL.D., mining engineer, metallurgist, lawyer, and author, was born in Cincinnati, Ohio, April 27, 1840, the son of Robert Raikes and Mary Anna (Pratt) Raymond; grandson of Eliakim and Mary (Carrington) Raymond, of New York City, and of Caleb and Sally (Walker) Pratt, of Providence, Rhode Island.

He was of English descent, his earliest American ancestor on the paternal side, Richard Raymond, having emigrated from England to this country and settled at Salem, Massachusetts, in 1632; while on his mother's side he was descended from well-known New England families. His great-grandfather, Nathaniel Raymond, was an officer in the Revolutionary army; and his grandfather, Caleb Pratt, served in the war of 1812.

His father (born 1817, died 1888), a native of New York City, was a graduate of Union College in 1837, editor of the Syracuse 'Free Democrat' in 1852, and the 'Evening Chronicle' in 1853-4, and afterward professor of English in the Brooklyn Polytechnic Institute and principal of the Boston School of Oratory. His mother (born 1818, died 1891) was a native of Providence, Rhode Island. They were married at Columbus, Ohio, in 1839, and Rossiter was the eldest of a family of seven children, of whom four were sons.

He received his early education in the common schools of Syracuse, New York, and in 1857 entered the Brooklyn Polytechnic Institute, of which his uncle, John H. Raymond (afterward president of Vassar College), was then president, graduating from that institution, at the head of his class, in 1858. He spent the ensuing three years in professional study at the Royal Mining Academy, Freiberg, Saxony, and at the Heidelberg and Munich universities.

Returning to the United States in August 1861, he entered the Federal army and served as aide-de-camp, with the rank of captain, on the staff of Major-General J. C. Frémont, by whom, during his campaign in the Valley of Virginia, he was officially commended for gallant and meritorious conduct.

From 1864 to 1868, he engaged in practice as a consulting mining engineer and metallurgist in New York City; and in the latter year was appointed U. S. Commissioner of Mining Statistics, which position he held until 1876, issuing each year 'Reports on the Mineral Resources of the United States West of the Rocky Mountains' (8 vol., Washington, 1869-76), several of which were re-published in New York, with the titles of 'American Mines and Mining', 'The United States Mining Industry', 'Mines, Mills and Furnaces', and 'Silver and Gold'

These reports contained descriptions of the geology, ore deposits, and mining enterprises of the United States public domain, discussions of metallurgical processes adapted to American conditions, and observations and criticisms concerning the practical operation of the Federal mineral-land laws of 1866 and subsequent years. In 1870, he was appointed lecturer on economic geology at Lafayette College, which chair he occupied until 1882, and for one year during that period gave the entire course on mining engineering.

In 1873, Dr. Raymond was appointed United States Commissioner to the Vienna International Exposition, and as such delivered in Vienna addresses in the German language at the International Convention on Patent Law and the International Meeting of Geologists; and an address in English at the meeting of the Iron and Steel Institute in Liège, Belgium. From 1875 to 1895, he was associated as consulting engineer with the firm of Cooper, Hewitt & Co., owners of the New Jersey Steel & Iron Co., the Trenton Iron Co., the Durham and the Ringwood iron works, as well as numerous mines of iron ore and coal. As president of the Alliance Coal Co., and director of the Lehigh & Wilkes-Barre Coal Co., as well as a personal friend of Franklin B. Gowen, he became acquainted with the inner history of the memorable campaign against the 'Molly Maguires', and has since been known as a fearless opponent of all tyranny practised in the name of labor. His articles on 'Labor and Law', 'Labor and Liberty', etc., published in the 'Engineering and Mining Journal' at the time of the Homestead riots, attracted wide attention and for these, as well as similarly frank discussions of the operations of the Western Federation of Miners in Montana, Idaho, and Colorado, he received special denunciations and threats from the labor-unions thus criticised. While connected with Cooper, Hewitt & Co., he also assisted Abram S. Hewitt in the management of Cooper Union and for many years directed the Saturday Evening Free Popular Lectures on science, etc., which constituted the beginning of what has since become a vast lecture system in the city of New York.

From 1885 to 1889, he was one of the three New York State Commissioners of Electric Subways for the city of Brooklyn, and served as member and secretary of the board, preparing its final report, which was generally regarded as the best statement of the problem of municipal engineering and policy involved in the distribution of electric conductors. At the close of his official term as Commissioner, he became consulting engineer to the New York & New Jersey Telephone Co., which position he retained for many years.

In 1898, Dr. Raymond was admitted to the bar of the Supreme Court of New York State and of the Federal District and Circuit Courts, his practice being confined to cases involving either mining or patent law, in the former of which he was a leading authority. In 1903 he was

lecturer on mining law at Columbia University, New York. He had also delivered numerous addresses at other colleges and universities, including Yale, Cornell, Pittsburgh, Lehigh, Lafayette, Union, California, the Worcester Polytechnic, and the New York College of Physicians and Surgeons.

An original member of the American Institute of Mining Engineers, he served as its vice-president in 1871, 1876, and 1877, president from 1872 to 1875, and secretary from 1884 to 1911. In the last capacity he edited 40 of the annual volumes of *Transactions*, to which he liberally contributed essays, especially pertaining to the Federal mining laws, as well as other articles of importance.

In 1911, Dr. Raymond resigned his position as secretary of the American Institute of Mining Engineers, of which he was after that time secretary emeritus.

Dr. Raymond was the editor of the 'American Journal of Mining' from 1867 to 1868, of the same periodical under the title 'Engineering and Mining Journal' from 1868 to 1890, and thereafter was a special contributor to that journal. In 1884, he prepared for the U. S. Geological Survey a historical sketch of mining law which was subsequently translated into German and published in full by the 'Journal des Bergrechts', the only periodical in the world devoted exclusively to the subject of mining jurisprudence, and for which he received high praise.

In addition to the official works previously mentioned he was the author of 'Die Leibgarde' (1863), a German translation of 'The Story of the Guard' by Mrs. Jessie Benton Fremont (1863); 'The Children's Week' (1871); 'Brave Hearts' (1873); 'The Man in the Moon and Other People' (1874); 'The Book of Job' (1878); 'The Merry-go-Round' (1880); 'Camp and Cabin' (1880); 'A Glossary of Mining and Metallurgical Terms' (1881); 'Memorial of Alexander Mining Law' (1883-95); 'Two Ghosts and Other Christmas Stories' (1887); 'The Life of Peter Cooper' (1897); various technical works and papers on mining law, as well as numerous addresses and magazine articles, and contributions to several American dictionaries and encyclopedias.

In 1909, in collaboration with W. R. Ingalls, he contributed to the first Pan-American Scientific Congress, held at Santiago, Chile, a paper on 'The Mineral Wealth of America', and at the second congress, which assembled at Washington, D. C., in 1915, he was represented by a paper entitled 'The Value of Technical Societies to Mining Engineers'. 'The Conservation of Natural Resources by Legislation' was delivered in 1909 before a joint meeting of the four national engineering societies.

In 1916, Dr. Raymond published a volume of poems, entitled 'Christus Consolator and Other Poems'. At the time of his death he was at work upon a history of the American Institute of Mining Engineers, which he hoped to finish this year.

In 1910 the 70th birthday of Dr. Raymond was celebrated by a dinner at which all branches of the engineering profession, the scientific and learned societies, and the prominent institutions of learning were represented. On this occasion the gold medal of the Institution of Mining and Metallurgy was awarded to Dr. Raymond "in recognition of eminent services and lifelong devotion to the science and practice of mining and metallurgy, and of his numerous and valuable contributions to technical literature".

In 1911, during the visit to Japan of members and guests of the American Institute of Mining Engineers, Dr. Raymond received from the Mikado the distinction of Chevalier of the Order of the Rising Sun, fourth class—the highest ever given to foreigners not of royal blood—"for eminent services to the mining industry of Japan". These services consisted in advice and assistance rendered in America to Japanese engineers, students, and officials throughout a period of more than 25 years.

Dr. Raymond was an honorary member of the Society of Civil Engineers of France, the Iron and Steel Institute and the Institution of Mining and Metallurgy of Great Britain, the Mining Society of Nova Scotia, and the Australasian Institute of Mining Engineers. He was a fellow of the American Association for the Advancement of Science, and of the American Geographical Society, a member of the American Philosophical Society, the Brooklyn Institute of Arts and Sciences, the American Forestry Association, and various other technical and scientific organizations both at home and abroad. He received the degree of Ph.D. from Lafayette College in 1868, and that of LL.D. from Lehigh University in 1906. On the latter occasion, speaking as an adopted alumnus of the University, he delivered to the graduating classes an address on 'Professional Ethics' which has been widely quoted and approved.

In February 1915, Dr. Raymond delivered the commemorative address on the 150th anniversary of the foundation of the University of Pittsburgh, and received from that Institution the honorary degree of LL.D.

On March 3, 1863, at Brooklyn, New York, he married Sarah Mellen, daughter of William R. and Mary (Fiske) Dwight of that city. Of their five children two survived to adult years; Alfred (born 1865, died 1901), an architect and engineer of thorough training and great promise; and Elizabeth Dwight (born 1868), since 1892 the wife of H. P. Bellinger of Syracuse.

He died suddenly, of heart failure, at his home in Brooklyn, on the evening of December 31, 1918, and was buried in Greenwood cemetery.

Biographical Sketch

By ELIZABETH D. R. BELLINGER

Rossiter Worthington Raymond was born in Cincinnati, Ohio, on the 27th of April, 1840. His parents were of English stock, settlers in Connecticut and Vermont. The gifts that he inherited from them made a fine equipment for his life's work, but that which he wrought with them was all his own.

His father, Robert Raikes Raymond, was a many-sided man. After his graduation from Union College at Schenectady, New York, in 1837, he had worked at journalism, studied law and then theology, preached in the Baptist pulpit for several years, returned to journalism, and at last taken up the work of teaching, first in the Brooklyn Polytechnic and afterward as principal of the Boston School of Oratory. He had a genial presence and great charm. He could sing and act and read and recite, and his fund of spontaneous wit was inexhaustible. He was an eloquent orator in his younger days and a graceful speaker always. He had the fire and sparkle of genius in all that he did, and the ups and downs of elation and discouragement which often accompany these. He was a thorough student and interpreter of Shakespeare, and there are people still in Brooklyn and Syracuse who remember his dramatic readings with keen appreciation.

Rossiter's mother was Mary Anna Pratt, of Providence, Rhode Island. She was highly educated for her time, and was by nature a student. She was proficient in mathematics, in music, and in languages, and kept the love of study all through her life to such a degree that it was no rare sight even in her very latest years to see her going upstairs at bedtime with a book in French or Italian under one arm and a dictionary—in case of need—under the other. Her presence was a quiet one. She was an indefatigable worker at whatsoever her hand found to do, either in the way of household duties or hospitalities, and she was possessed of a power of concentration often mistakable for absence of mind. She always knew where things were, and also where they belonged, which is different; and in consequence of this valuable faculty, and because of her clear dispassionate judgment in all perplexities, she was leaned upon and referred to, not only by the household but the larger family circle as well. If I should say that Rossiter received brilliancy from his father and steadiness of purpose from his mother, that would imply what is not true—that his mother was not brilliant and his father was infirm of purpose; but it is fair to say that what was

'temperamental' came from his father, and that his mother endowed him with the dogged devotion to routine which stood him in such good stead throughout his life.

Soon after Rossiter's birth in 1840 the family moved from Cincinnati to Hamilton, New York, where his father took a two years' course in theology at the Madison University. Just one item concerning the babyhood of the little son came to light in a passage of a letter written at that time by his young mother to a school friend of hers. But the item, though small, is significant. She wrote: "Rossy is a plain child, but he is very wise".

The years from 1842 to 1847 were spent at Hartford, Connecticut, and during this time the little boy was unfolding with unusual speed. His grandmother Pratt was wont to gaze gravely at him, as he sat absorbed in some child's mystery, and say: "You'll never rear that child". This mournful prophecy is scarcely to be wondered at when one confronts the dreadful fact that he had mastered the Greek alphabet and finished the first Greek primer by the time he was six years old. But in after years, he himself used hotly to deny that this was precocious, arguing that "Alpha, Beta, Gamma, Delta" was just as easy as "Ena, Mena, Mona, Mi" for an interested baby with a parrot's memory. He applied that theory long afterward upon his own grandson, who electrified the neighbors, at the ripe age of four, by talking of quartz and hornblende in the dusty country-road, and exclaiming over the "mica in the river" when it sparkled in the sun.

If Hartford might be called the cradle of little Rossiter's scholarship, surely Syracuse saw the beginning of his human enthusiasms, the budding of that trait of ardent, headlong, uncalculating partisanship of his fellow-man—especially his fellow-man in trouble—which enlivened and colored his whole life. For it was at Syracuse, between his seventh and his sixteenth year, that he grew into the knowledge of the slavery conditions which induced so many good citizens, foremost among them his own father, to defy the fugitive-slave law and operate—with much skill and secrecy, but the clearest of consciences—the 'Underground Railway' that led from bondage to freedom over the Canadian border. One occasion he often recounted; it happened probably when he was eleven or twelve and his brother Charles two years younger. A fugitive slave was in hiding in the Raymonds' house, and the two boys were allowed to go into the kitchen with their father when he went to interview the poor fellow. For the benefit of the curious and not too sympathetic children, he drew the man on to tell of his separation from his wife, and from child after child in succession, and at last said: "But, of course, it isn't as if you were white. Surely you negroes do not feel about your children as we do about ours". The humble rejoinder, "Oh, Massa, we does love 'em!" brought forth a burst of hearty weeping from the

boys, and it is safe to say that that path of access to their hearts was never closed again.

Syracuse also was the scene of much boyish development of accomplishments. Camping and tramping and playing Indians (their boat was named 'Ayacanora' for the beautiful savage in 'Westward Ho!'), private theatricals in the barn, and story-telling and guessing games in the evenings, to say nothing of impromptu charades in which the elders of the family were stars—these were excellent ways to sharpen youthful wits, as well as to build happy memories for after-life. An appreciative nature such as Rossiter's could not fail to profit enormously by such well-springs for his mental and spiritual thirst; his young soul blossomed abundantly.

When the family went to Brooklyn in 1856, it was in truth a home going, for Robert Raymond had been born there, and his eldest sister, Mrs. John Tasker Howard, with her husband and children still lived there. She faithfully maintained her father's lifelong habit of holding prayers on Sunday afternoons, and to her house, accordingly, all the members of the big and increasing circle were wont to repair at 5 o'clock every Sunday. Into this big gathering, also, came Henry Ward Beecher, often, as a welcome member, and the atmosphere he brought with him gave the simple household service something of the spirit of Bethany. To all the children and young folks of that fortunate family, and to Rossiter not least, the affairs of the Kingdom of Heaven were as vital and interesting as their school doings or their plans for the vacation. He had now become a student at the Brooklyn Polytechnic, where his father was professor of English literature and rhetoric, and his uncle, Dr. John Howard Raymond, the first president. In May 1857, he joined the membership of Plymouth Church, when its own great life was of but ten years' standing.

Another interest was beginning for Rossiter—or 'Ros', as he was invariably called—in his friendship with the Dwight family. There were several young people in the household, but the youngest, Sarah Mellen, was nearest his own age. She was an animated enthusiastic schoolgirl at the Packer Institute, and her family circle, like his, was wont to have its good times all together, regardless of age. Ros, at this period, must have been particularly charming, with dark curly hair, keen and merry eyes, and a deep dimple in his chin. He escorted Miss Sally to many a meeting of the Zetaethian Society at the Polytechnic, where he exercised his youthful eloquence in debate, or his learning in the reading of literary papers. The romance was begun, even though undeclared and perhaps unrecognized, before he was graduated, at the head of his class, in 1858, and set sail for Europe on that famous clipper ship, the 'Great Western' of the Black Ball Line. He used to enjoy telling the story of the series of disasters that the good ship encountered, and how at last "with half a

rig and half a crew, and on half allowance of water, she finally crawled down through the Irish Channel to Liverpool, a surprise to her underwriters". That this youth, "in search of his fortune", should have opened his career by becoming third mate to a clipper ship in distress was, to the end of his days, a source of romantic delight to him.

He studied at the universities of Munich and Heidelberg and the Mining Academy of Freiberg, and acquired, besides a good theoretical foundation for his profession of mining engineer, a thorough love and knowledge of the German language both technical and literary, and a number of permanent friendships from among his American fellow-students, notably that deep and sincere one with the late Judge John H. Boalt of San Francisco, which retained its pristine boyish enthusiasm to the very last time they met.

One month's holiday he took in the summer of 1859, with a party of six other American students, on foot in the Tyrol. Many a reminiscence of the 'Seven Jolly Gentlemen' enlivened his memories afterward, and a glance into his diary for that month shows the multitude and variety of his enjoyments: mountain scenery, arguments political and philosophical, jokes, raillery, chess, and song. He had already developed that capacity for fellowship in fun and in earnest which characterized him always.

In the winter of 1860 he started on foot to Italy to join some members of the Howard family who were sojourning at Florence. On the way down, crossing the Austrian frontier, he was arrested as a spy and found himself involved in a serio-comic adventure, at the climax of which he was obliged to deliver a speech—a sonorous patriotic speech in praise of liberty, in purest Ollendorf—somewhat thus: "Am I a German? No! Am I an Austrian? No! Am I a Frenchman? No! Am I an American? Yes! (Cheers. Viva America!) Are you Germans? No! Are you Austrians? No! Are you Frenchmen? No! Are you Italians? Yes! (Viva Italia! Cheers)," and so forth and so on; whereupon the group of Garibaldians, his listeners, were so fired by his oratory that they restored his passport, procured for him the best seat in the diligence, and sent him on his way with acclamation. In after years, when he was besought to write out the account of this amusing episode, he used to say, with a twinkle in his eye: "Ah, don't make me write it out; if I do that, I can never again tell it with embroidery!" I can testify, however, that the "embroidery" never varied through many tellings, unless it be that sometimes he remembered more Ollendorf than at others, according to his mood.

In Florence he was welcomed by a lively company of friends and cousins. The original group had been augmented by the presence of Mrs. Harriet Beecher Stowe and several of her own young people, and for a time also by Robert and Elizabeth Barrett Browning. Rossiter

shared their wanderings through Florence, Rome, and southern Italy, and in the old town of Salerno, near Naples, they were detained for several days by heavy rains. There, to beguile the time, an evening of general contributions was proposed; one of these was a poem by Rossiter on the Bay of Naples; another was a story by Mrs. Stowe, which she afterward developed into the exquisite medieval romance, 'Agnes of Sorrento'. After their return to Florence, our young student's holiday was over and he went back to Germany; the Stowes departed to Paris, and the Howards visited Venice and Milan; and there their brilliant and beautiful daughter, who had been in truth the princess of the party, fell ill of fever and died. The news, reaching Ros at Freiberg, smote him with all the force of a first great experience of grief, and his verses, which up to that time had been elaborately jocular or ponderously philosophical, acquired a touch of tenderness, which afterward was always to be found in his religious poetry.

In 1861 the Civil War broke out, and he sailed for home in the summer of that year and secured duty on the staff of Major-General John C. Frémont, with rank of captain. His service was largely secretarial, but by no means exempt from hardships and dangers, and he was officially commended, during the campaign in the Valley of Virginia, for gallant and meritorious conduct. One unprecedented piece of official duty fell to his lot, of which he used to tell with relish. One day when he was in command of the camp, in the absence of the ranking officer, a bashful couple made their appearance from the fastnesses of the mountains, in search of a minister to perform for them the marriage ceremony. They were disconcerted to find the country in a state of war; there were no ministers to be had, nor indeed any magistrates; and the swain stared at his sweetheart and she stared at him, utterly at a loss as to the next step to take. The appeal of the situation was not to be resisted, and Captain Raymond came to the rescue. Upon a large and impressive sheet of fools-cap paper he created a document, setting forth that *whereas* there were no ministers of the Gospel in the vicinity, and *whereas* the nearest magistrate was many miles away, and *whereas* the commanding officer of this post was absent, and *whereas* this couple had made a long journey from their homes for the purpose of being joined in matrimony and appeared to be determined to go to housekeeping in any case, *therefore*, he, the undersigned, etc., etc. The ceremony was duly performed, and the confiding bride and groom trudged back, rejoicing in their wedding certificate.

Since his return from abroad, he had become engaged to Miss Sally Dwight, and in 1863, when he had quitted the army, they were married. He brought his young wife into the big household, which included his parents, his grandmother Pratt, and his two sisters. Professor Raymond was so vivid and dominant in the social life of the family that one is

tempted to wonder how his son found opportunity to develop his own personality as he did; but the truth remains that from 1863 until 1888 when Professor Raymond died, these two men lived almost continuously together, and as masterful, argumentative, open-hearted, consulting one another continually, and devotedly proud of one another, and withal as distinctly individual as if each were sole master of a separate world.

It was in the same year in which he was married that he went into partnership with Dr. Justus Adelberg as a firm of consulting engineers and metallurgists in New York. The next five years was a period of the most intense absorption in work. He had a faculty of banishing completely from his consciousness all ideas, impressions, and even sounds that were not connected with the matter in hand. Mrs. Raymond used to tell of him that once when she had been recounting something with great animation, she suddenly perceived that he was writing, and exclaimed: "Oh Ros, am I disturbing you?" To which she received the amiable reply: "No, my dear, not at all; keep right on talking, but don't ask any questions!" He had a little work-room in the attic known as 'the den', which was faithfully untouched by arranging hand or duster, and more than once some especially urgent piece of work carried him past meal-time and bed-time, and sometimes through the night. One of the strongest traits in his character was his passionate joy in a job. He confronted it with delight when he began it; he looked upon it with something very like love when it was achieved. As he always preferred to share his enjoyments, so in his work there was no exception to the rule. He told somebody beforehand what a big thing he was about to tackle and he told somebody afterward that it was successfully done. It did not seem to be praise that he needed, nor a chance to boast; it was a hearty taste for human sympathy—a sense of team-work that enhanced his pleasure.

In 1868 he was appointed United States Commissioner of Mining Statistics, and from then until he relinquished the appointment in 1876 he spent many weeks every year in extensive trips west of the Rocky Mountains. During those years he was busy also in many other ways, for his interests were multiplying fast. From 1867 to 1890 he was editor of the 'Engineering and Mining Journal', the details of which enterprise are, I think, recounted elsewhere. In 1871 he had assisted in organizing the American Institute of Mining Engineers at the historic meeting at Wilkes-Barre. From 1870 until 1882 he was lecturer on economic geology at Lafayette College, and in one of those years he gave the whole course on mining engineering.

Throughout his long absences from home he kept up a lively correspondence with his home circle, and his letters never dwindled down to the "expect me on the 5:15; love to all" type of the usual busy worker. On the contrary, his letters were full of descriptions of beautiful country,

accounts of his own doings and the people he met, rhymes, jokes, and always great enthusiasm for his work. His memories of those days, which must have been so full of hardships and fatigues and difficulties, seem to have retained for him the keenest zest all through his life. He talked of them as a young man talks of his pranks at college, and, indeed, all his enjoyments were like a boy's in their simplicity.

In 1873 he was appointed United States Commissioner to the Vienna International Exposition. In the course of his visit he delivered addresses in German at the International Convention on Patent Law, and at the International Meeting of Geologists, and one in English at the meeting of the Iron and Steel Institute at Liège, Belgium.

In 1875 he became associated with the firm of Cooper, Hewitt & Co., owners of the New Jersey Steel & Iron Co., the Trenton Iron Co., the Durham and the Ringwood iron works, and various coal and iron mines, as their consulting engineer. He continued with them until 1895, and for all but two of these years he spent his summers in a house on the Cooper & Hewitt estate close to the Durham iron works, in Pennsylvania. Those nineteen seasons at Durham Woods are glorified in memory for a thousand reasons, but chiefly, I think, for the fact that Dr. Raymond came back from the city every Friday night and stayed until Monday morning. Therefore the week-end was a time of holiday, and he had leisure to share in the fun. He was a daring and skilful driver and loved nothing better than to pilot a big wagon-load of singing laughing young folks over the incomparable hills of Bucks county or along the sparkling Delaware at the foot of the Nockamixon cliffs. In the evenings there was always something afoot. As ever, it was Professor Raymond who was leader of the revels—I had almost said Lord of Misrule—but Dr. Raymond joined the games or led the applause. In the impromptu games, such as Twenty Questions and Crambo—this last, a rhyming game—he took part, sometimes under protest; the young people would invade his study, which was not quite so solemnly sacred as the Brooklyn 'den' and drag him away from some left-over of city work; but when once his blood was up, his only rival was his father, and the frolic always ended in peals of laughter. The game of chess hardly belongs in the list of his diversions, so serious was his devotion to it.

There was always a great deal of singing: hymns, college songs, and the latest operettas, and his excellent voice was available for tenor or bass, according to the needs of the occasion. Sometimes he was at the piano; he had a good touch and a natural gift for harmony, but having had no training he played entirely by ear.

His connection with Cooper, Hewitt & Co., brought him in contact with many phases of the coal and iron industry and into an intimate understanding of the labor conditions of that period. As president of the Alliance Coal Co. and director of the Lehigh & Wilkes-Barre Coal Co., as well

as through his acquaintance with Franklin B. Gowen, he came to know a good deal about the 'Molly Maguires' and the vigorous campaign against them, and these things, acting on that same sturdy partisanship to which I have referred before, produced in him an antagonism against the tyranny of some labor organizations over their own members that endured through his whole life. For his outspokenness he was not loved, particularly by the labor-unions in Montana, Idaho, and Colorado; he received more than one threatening letter.

He had many loyal friends among the miners and furnace-men at Durham, however, from Jerry at the foundry, who spoke of him as 'the mather' to Ephraim Weeder, the Pennsylvanian Dutchman, who called him 'Rossy'! One instance of admiration amounting to eulogy became a classic in the family. There was to be a Sunday-school picnic in the little settlement at the Rattlesnake mine where the Welsh and Cornish miners lived; Dr. Raymond went over on horseback to take part in the 'exercises', carrying with him several volumes of his stories as a donation to the Sunday-school library. Old Willy Bray, superintendent of the Sunday-school and also of the mine, introduced the honored guest in a complimentary speech, which ended thus: "And besides knowing all about iron mines and coal mines and blast-furnaces, and all about the Bible, he writes stories; and he has brought with him some of his story-books to give to our library; and I'm not going to tell you what's in 'em, for you'll read 'em for yourselves, but I'll say this—how the mind of man can spring around among such matters, God knows and I don't!"

During his years with Cooper, Hewitt & Co., he served for many seasons as manager of the free Saturday-night lectures at the Cooper Union, which involved his invariable attendance in the lecture-hall once every week, besides the arranging of lectures and securing of speakers. Sometimes he himself was the lecturer. These duties, and his work from 1885 to 1889 as one of the three New York State Commissioners of Electric Subways for the city of Brooklyn, and his subsequent position as consulting engineer to the New York & New Jersey Telephone Co. made him a much rarer social factor in the city family-life than in the country—except for the stimulating table-talk, in which the honors between him and his father were about even—but his activity in Plymouth Church through all these busy years kept him in close touch with the interests and joys and sorrows of his friends, as indeed he always was, no matter what form of work absorbed him. I cannot undertake to tell of his multifarious doings in the Plymouth life and especially the Sunday-school. He had given himself to these things soon after his return to civil life in 1863, and with him to belong to an organization did not mean merely going to its meetings; it meant teachers' meetings for conference as to methods of study, social gatherings to promote acquaintance, and a thousand other things. In this case too it brought into being the cher-

ished custom of writing the annual Christmas story and reading it himself to the school on the Sunday nearest to Christmas, which became quite as dear to him as to the school itself. Later, he took in hand an adult bible-class, the projects for which were always in his thoughts so that even in his summer vacations he was constantly planning what subject he would take up next with the class, or what he would recommend to the class for home reading. He understood truly how to espouse a cause—to love and cherish it, and to keep house with it.

In 1898 he was admitted to the bar of the New York State Supreme Court and of the Federal District and Circuit Courts, confining his cases to those concerning mining law, on which he had become an authority, and patent law. In 1903 he was lecturer on mining law in Columbia University. He also delivered many addresses at other colleges and universities—Yale, Cornell, Pittsburgh, Lehigh, Lafayette, Union, California, the Worcester Polytechnic, and the New York College of Physicians and Surgeons.

He was, of course, deeply concerned from the first in the growth of the American Institute of Mining Engineers. In 1871, 1876, and 1877 he served as vice-president, and as president from 1872 to 1875. In 1884 he became secretary and so continued until 1911, after which he was secretary emeritus until he died. Forty of the volumes of the Transactions represent his editorial work, and they contain also many special articles contributed by him.

In the summer of 1899, in connection with a Colorado meeting of the Institute, Dr. Raymond, with a party of some twenty friends and guests, made an extended trip through the West in a private car. It was on that trip that he had his first glimpse of the Grand Canyon of the Colorado; it was to him an overwhelming spiritual experience. He had seen many splendors in both old countries and new, but I think none enriched his treasury as did this unearthly vision; and that is why I cannot pass it by, even in this slender narrative. It was his chief characteristic, perhaps, that all his emotions, grave or gay, were so spontaneous that he never felt any incongruity in going swiftly from one to another. Tears and laughter alike were frankly unconcealed, and yet I think these transitions did not impair his dignity. Whatever mood was uppermost was so genuine that it could not seem ill-timed.

In 1909, in collaboration with W. R. Ingalls, he contributed to the first Pan-American Scientific Congress, held at Santiago, Chile, a paper on 'The Mineral Wealth of America', and at the second congress, assembled at Washington, in 1915, he was represented by a paper entitled 'The Value of Technical Societies to Mining Engineers'. 'The Conservation of Natural Resources by Legislation' was delivered before a joint meeting of the four national engineering societies.

In 1910 there was a dinner at the Plaza hotel, New York, in honor of Dr. Raymond's 70th birthday, at which were gathered representatives of all branches of engineering, members of many scientific societies, and shining lights from various departments of life, and, what was most notable, all attending from motives of personal friendship. He was awarded on this occasion the gold medal of the British Institution of Mining and Metallurgy "in recognition of eminent services and lifelong devotion to the science and practice of mining and metallurgy, and of his numerous and valuable contributions to technical literature". He was presented also with a handsome service of silver, on each piece of which was engraved a picture representing some phase of his varied career; and with the silver a sumptuously bound volume containing many letters of congratulation and affection, and the names of the hundreds of subscribers to this beautiful token of friendship.

In 1911 he took Mrs. Raymond with him to Japan, in a party of members and guests of the Institute, and during that visit the Mikado conferred upon him the Order of the Rising Sun, fourth class, "for eminent services to the mining industry of Japan". These services consisted of advice and help given in America to Japanese engineers, students, and officials, over a period of more than 25 years.

In 1913 he and Mrs. Raymond celebrated their golden wedding anniversary at Atlantic City with a quiet gathering of their nearest relatives. It was characteristic of all such occasions that, while the younger people flattered themselves that they were presenting this celebration as a surprise to the chief personages of the day, it was discovered when they sat down to dinner that there were verses for each one of the party, prepared by Dr. Raymond. At this point I desire to say a word as to his home verses. Much has been said at different times as to the simplicity and sincerity of his religious poetry, which had no irregularities of meter nor obscurities of form, but embodied his thought as lucidly as any prose could do; and his after-dinner rhymes read at various Institute banquets, with their professional hits and their fantastic puns—worthy of Thomas Hood at his wildest—are well known; but his home verses, written for Christmas gifts, birthday greetings, and a hundred other things, full of 'local jokes', love, philosophy, and boyish absurdity—these have a neatness and felicity of phrase which was the height of his unconscious technique. In speaking of versifying, to one of the Durham young folks once, he said: "If you have a good strong line, save it for the last. The reader will never notice a little 'padding' if you hide it in one of the earlier lines; but your climax ought to be as crisp as the snap of a whip". It would be difficult to find any rhyme of his, however trivial, that did not wind up in triumph. An excellent example of his dainty workmanship is this verse for a Valentine's Day party.

A Valentine, they say,
Is a sort of trial lover
Whom one may throw away
When the experiment's over.

On these conditions, I pray,
Take me, though soon we sever;
I'd rather be yours one day
Than anyone else's forever.

Nay, I will go further in it,
And make my utterance stronger;—
I'd rather be yours one minute—
Than even yours any longer!

In February 1915, Dr. Raymond delivered the commemorative address on the 150th anniversary of the founding of the University of Pittsburgh, and received from that institution the honorary degree of LL.D. He had previously received the same distinction from Lehigh University in 1906—the first honorary degree ever conferred by Lehigh—and many years before, in 1868, he had received the Ph.D. from Lafayette College.

This is, perhaps, the point at which to record the list of his memberships. He was an honorary member of the Society of Civil Engineers of France, the Iron and Steel Institute and the Institution of Mining and Metallurgy of Great Britain, the Canadian Mining Institute, the Mining Society of Nova Scotia, and the Australasian Institute of Mining Engineers. He was a fellow of the American Association for the Advancement of Science, and of the American Geographical Society, a member of the American Philosophical Society, the Brooklyn Institute of Arts and Sciences, the American Forestry Association, and various other technical and scientific organizations both at home and abroad.

All the phases of the War, and especially after the United States had at last joined in the cause, were followed by him with intensest interest. There was many a spirited meeting of the Neighborhood Club in the little Connecticut village where he spent his summers, when he contributed extracts from his overseas mail or glowed with excitement over the stirring readings of others. Whether he listened or spoke, he always infused a thrill into any assemblage to which he came and in which he took part, by the animation of his mere presence. His country pastor said of him, in his address in Plymouth lecture-room at the funeral services: "No minister had a better listener than we ministers had in Dr. Raymond. He was a genius at listening; it almost seemed to me, in our little church, that he listened out loud, we were so completely conscious of the intensity of his following our thought, or going ahead of it". His neighborly relationships in this little New England village were many and varied. Political discussions with anyone who would pick up his gauntlet, chess

with the minister, Sunday afternoon talks in the Congregational church on the Green, and tireless reading aloud from novels, newspapers, and magazines, any day and all day, just as long as there were listeners—these give but a dry account of the spirit and vitality that bubbled like a perpetual spring through all his days. Even at the dinner-table, at the mention of any moot point, he would jump up and charge upon the bookcase, bringing back a dictionary or a volume of the encyclopedia and making room for himself beside his plate as though there were not a moment to spare.

It was nearly Christmas when he and his wife and sister returned to their city house in the fall of 1918. His annual Christmas story had yet to be written, but the fact that it was to be the fiftieth acted as an irresistible spur upon his energies, and he achieved it just before the arrival of the two or three remaining members of the family not in France. He welcomed them heartily and confided at once to one of them that he had written not only the usual Christmas story but several rhymes for Christmas (tomorrow), he even read some, in confidence, because it seemed such a pity to wait a whole day!

His Christmas Day was filled with tranquil satisfactions; two or three overseas letters of recent arrival to be re-enjoyed with the newcomers; some acceptable gifts and books; the rhymes aforesaid; a bout at cribbage; and a few friends dropping in at odd times during the day. The next day was very like it. On the evening of Friday, the 27th, he delivered an address on the spiritual influences of the war at the Plymouth prayer-meeting, which was accounted one of his best and most ringing speeches by the friends who heard it. He had confessed that day to feeling not quite well, and when, upon starting off to Plymouth Church, someone commiserated him for having such a task before him, he made the rejoinder he was so fond of making: "If I'm to go down to the church and do the Lord's business, He will have to take care of my ailments, for I really can't attend to both". In the same spirit he was equal and more than equal to his happy mission on Sunday morning, and went off to Sunday-school to read his fiftieth story and preside over his bible-class, returning all in a glow of pleasure later with an enormous sheaf of 50 red roses presented to him from the children. All that day was a day of joy to him, lit with the satisfaction of these two recent tasks well accomplished and the pleasure in other people's pleasure. It was not unlike many and many other Sundays in his life—indeed it was a striking type of his particular style of Sunday, for upon analysis it would have shown clearly enough that the source of his delight was in the depths of his own nature and in the lavish outpouring of his own energy. Is not this a foretaste of "having life more abundantly"? On Monday he rested as the doctor bade him do, and that day and the next were the only instances of his even seeming less well than usual. The end came swiftly and most

beautifully. He had been in conversation, off and on, until early evening, and had discoursed at some length on the subject of Gounod's music with one of the family who was going to the opera, when a sudden accession of pain interrupted him—and he was gone. All his departures through life were like that; eager conversation to the last minute, then a "Well—I must be off"—and if one reached the window soon enough, one might perceive him swinging down the street, his characteristic hands in a ready-to-use attitude just showing from under the cape of his overcoat. It is impossible to resist the feeling that this last departure, like the others, was in eager quest of fresh and inspiring work elsewhere.

Reminiscences

BY LYMAN ABBOTT

Rossiter W. Raymond was born in 1840, studied abroad at Heidelberg, Munich, and the Freiberg Mining Academy; served as lieutenant and captain on staff duty during the Civil War; became an editor and special contributor of the 'Engineering and Mining Journal'; for three years was the president of the American Institute of Mining Engineers, and for 27 years its secretary; held degrees from Lafayette College and Lehigh and Pittsburgh Universities; was honored by election to scientific societies in France and Japan; attained such eminence in his chosen profession that he was admitted to the Bar as an attorney and counselor that he might argue a mining case before the Supreme Court; was a public speaker of both charm and power; wrote some entertaining short stories and some verse which has much charm both in its musical phrasing and in the strength and tenderness of its message.

For over sixty years he was a member of Plymouth Church, Brooklyn, and dedicated his varied abilities from the very first to its service. During my pastorate we worked together in intimate personal relations and in this paper I confine myself exclusively to what I know of him as a Christian and a church worker. My personal friendship antedates 1887 and continued to the day of his death, but others better qualified than I will speak of his abilities and services in other relations, as engineer, orator, scientist, and author.

Henry Ward Beecher died in March 1887. In the fall of that year I was invited to take pastoral charge of the church as 'stated supply' while the church was looking for a permanent pastor. This invitation came to me in the first instance, if I recollect aright, verbally through Dr. Raymond. On my intimation that I would undertake the service requested of me if the desire of the committee from whom it came was confirmed by the church, the matter was put before the church officers and as a result I received from Dr. Raymond the letter given below. Mr. Halliday, mentioned in that letter, had been for some years Mr. Beecher's assistant and on him had devolved much, perhaps I should say most, of the pastoral work. Mr. Townsend was a brilliant preacher in the Methodist church, holding conservative views on all biblical and theological questions; after Mr. Beecher's death he had preached a sermon in Plymouth Church on the Jonah story, emphasizing the importance of accepting its literal interpretation and unquestionable accuracy as history. Plymouth Church, though radically congregational in its government, was

essentially a union church in its theology and its spiritual life. It had in its origin adopted a creed, but the acceptance of this creed was not required as a condition of membership. The only condition was a simple covenant of loyalty to Christ and the acceptance of the Bible as a guide in the Christian life. It contained members of every type of theological belief from Unitarianism to high Calvinism, and from Quakerism to Episcopacy. The conservative members of the church were delighted with Dr. Townsend's sermon and wished to hear him again. The knowledge of these facts is necessary to the understanding of Dr. Raymond's letter, which follows:

Oct. 14, 1887

My dear Mr. Abbott:

The Board of Deacons last night adopted by a vote of substantial unanimity (one negative vote from a good brother whose function is always to vote 'No' on everything) and without a word from any quarter not thoroughly cordial to you personally—the advice of the Advisory Committee, as contained in the document I gave you (in which, however, after consultation, I erased the word 'pastor' and made it read 'temporary supply', 'filling the pulpit')—and appointed Mr. Halliday and myself a committee to carry it out. The collapse of the expected opposition was amusing, but not discreditable to the opposing brethren. It had been largely based on a misconception, and not at all on personal opposition to you. I found out that they thought this was a 'deep move' to prevent them from hearing this or that man whom they wanted to hear, and particularly Townsend, the hero of the Jonah sermon. So I explained elaborately beforehand that this arrangement was intended to facilitate the hearing of other ministers without embarrassing suspicion of candidacy—and then I "threw a tub to the whale" by proposing that Townsend should be sent for, and saying I would like to hear him too, although I would frankly confess that if that one sermon represented fairly his views of Scripture, he couldn't be my pastor. This brought out good-natured protests that they didn't necessarily want him for pastor but only desired to hear him again. So it was settled:

1. That you should be asked to begin the first Sunday in November (communion service in the morning); that Townsend should be invited for the second Sunday, morning and evening, and that (if he accepts) you should then go on regularly thereafter. All of which we will talk over and settle details.

Can you come to my office at, say, 4 P. M. today *en route* for Brooklyn? We can then have a talk before Halliday and I invite you formally or exchange notes with you. . . . Even if we have not settled all details by tonight, I shall still wish to make the announcement of the arrangement as proposed and probable, so that I can get into the papers the communication of the Advisory Committee, which sets forth the requirements of the Plymouth Church pastorate and will check some reactionary tendencies that are as yet only afloat and have not crystallized.

Yours

R. W. RAYMOND.

I give this letter substantially in full because it strikingly illustrates one phase of Dr. Raymond's character. He was a man of strong convictions, not easily swerved from the path he had marked out for himself. But he was always a 'good mixer'; he habitually respected the opinions,

prejudices, and even the ignorances of those who disagreed with him; and he had the skill to surrender minor points in order to secure important results. In fact, Dr. Townsend was sent for, came, and preached a sermon in which he laid stress on the doctrine of Eternal Punishment which Mr. Beecher had explicitly disavowed and which, at least in the form in which Dr. Townsend presented it, was probably held by only a small minority of the church membership. It brought all the members of the church to Dr. Raymond's conclusion that he could not be the pastor of a church educated under Henry Ward Beecher's ministry, and he was not again invited to what had been for forty years Mr. Beecher's pulpit.

I cannot better indicate the problem which confronted Plymouth Church on the death of Mr. Beecher than by quoting a few sentences from an address which I delivered in 1910, at a dinner given to Dr. Raymond on his 70th birthday:

When, in 1887, I was asked to fill for six months the pulpit of Henry Ward Beecher and then afterward called to be his successor, I entered upon what I recognized to be a very difficult task. He was a great orator—I think the greatest orator of American history—and I am no orator.

He had built up a great church filled with his enthusiastic and devoted admirers. I came to it a comparative stranger. The demand for sittings had been so great that the option of hiring pews at the regular rate was auctioned off, and the premiums were devoted to carrying on the work of the church, and were sufficient for that purpose. With his death this auctioning off of pews came necessarily to an end. Up to the time of his death, Plymouth Church was always filled, and even crowded. For the first year of my ministry it was never crowded, and was rarely really full.

I went to Plymouth Church with the ebb tide. But it turned and became a flood tide; the money raised for the work of the church was greater than it had been under the old regime; and the church work went on. When I came, men were saying—men in Plymouth Church and men outside Plymouth Church—that it was impossible to maintain it in its old locality; that we must tear it down and build smaller, or move away and all that.

This was not done; yet the church is still going on; and what I want to say to you ladies and gentlemen, is that I did not change that tide. It was changed by the loyalty of the lay members of Plymouth Church, and among them all there was no man more loyal or more serviceable than Dr. Raymond

In the spring of 1887, before the church had recovered from the shock of Mr. Beecher's death and was perplexed by problems and divided in counsels, but united in loyalty to its pastor's memory and to all for which he had stood during the forty years of his pastorate, a Plymouth League was organized, largely by the efforts of Dr. Raymond and on a plan originating with him. All the members of the church and congregation were invited to become members of this League; most of them did so. The League was divided into different departments, each assuming a specific function. It brought home to all the members of the church some sense of individual responsibility for the various phases of the church activity, such as its prayer-meetings and its three Sunday-schools, so

that when I came to the church in the fall I found, not a disorganized and scattered membership, but a united working body, held together not only by past memories but also by future hopes. This League became the social organization of the church, brought the widely scattered congregation together in monthly meetings held in the Sunday-school room and parlors, introduced the members to one another, furnished some entertainment, generally provided by the young people, and rendered an inestimable service by converting a Sunday audience into a Christian family. Not only in the organization of the League but in the arrangements of the programs in the earlier years of its existence—and often persons from outside the church were invited to contribute to the pleasure of the evening—Dr. Raymond took an active but not prominent part. He kept himself in the background, though always by his social qualities a leading figure in the life of the evening. Later we organized local gatherings of this League at the homes of church members in different parts of the city. Partly due to Dr. Raymond's directing activities, and still more to the inspirational effect of his example, Mrs. Abbott and I had rarely any other duty to perform than to go care-free to these social meetings of the League and act as host and hostess.

A more difficult problem was presented by the certainty that the church would have no more premiums from pew-rents to use in the support of its work. Some of the church members believed that some of that work must be discontinued, a policy of retreat which none of the leaders in the church ever entertained. Some proposed that for at least the first year the auction of pews should be continued and bidders be secured who would pay the premium necessary to carry on the work. The plan which was finally adopted was largely worked out by Dr. Raymond. It was a form of what has now come to be known as the 'envelope plan'. Plymouth Church was one of the early churches to adopt this plan, though it had been previously initiated at St. George's (Episcopal) Church in New York, by Dr. William S. Rainsford. The feature on which Dr. Raymond laid the greatest emphasis and which proved eminently successful, though it was adopted with a good deal of hesitation and misgiving, was a practical application of Christ's counsel in the Sermon on the Mount, "When thou doest alms, let not thy left hand know what thy right hand doeth". Only one person in the church, the treasurer of the fund, knew who were the contributors to this fund or what any individual contributed. Every contributor was given a number and the treasurer kept all his accounts in his books with these numbers. The appeal for funds was made only to the loyalty of the church membership, not at all to their approbateness. A Church Work Committee was organized to which was entrusted the collection and administration of the fund thus secured and a general supervision of the various forms of the work of the church, and Dr. Raymond was made

the first secretary of this committee. It was largely Dr. Raymond's faith in his fellow-men, his executive ability in organizing it, and, by his first report, furnishing an admirable precedent for his successors in office to follow, that gave this plan its success—for from the first it was a success. The free-will offerings of the congregation provided for our church work in that very first year nearly double the income that theretofore the surplus from the pew-rents had furnished. That this standard was well maintained during the subsequent years was largely due to the inspiring influence of Dr. Raymond and the tireless efforts of his coadjutor, H. W. B. Howard.

More important than his social and executive contributions to the life of Plymouth Church were Dr. Raymond's contributions to its intellectual and spiritual life. When his interest in biblical studies was first awakened I do not know. His father was a Baptist minister, and I suspect the son's interest was early inspired by his father's interest. When I came to Plymouth Church, it is perfectly safe to say that he knew more about the Bible, especially the Old Testament, than most ministers do. Whether he made use of the Greek or the Hebrew in his biblical studies I do not know, but he was thoroughly familiar with the German language and with German scholarship, though never poisoned with the curious German ambition to discover something to say that nobody had ever said before. Before I had come to Brooklyn, Rossiter W. Raymond had given a course of lectures on the Old Testament which had such attractive power that the lecture-room of Plymouth Church was filled on Sunday evenings by an audience which came to hear him while the church was crowded with a congregation gathered to hear Mr. Beecher on other themes. Mr. Beecher's service to the church and to the country by his advocacy of evolution and subsequently of the so-called higher criticism, when both were either ignored or condemned by the great body of clergy in all denominations, was at the time well known, though now too generally forgotten. His sermons on 'Evolution and Religion' were published in 1885, and his sermons on bible studies, in 1893. I have always believed that the inspiration for his attitude on both these subjects came largely from Dr. Raymond and Thomas G. Shearman. Certainly he had no more faithful and loyal supporters in this campaign for a larger and freer interpretation of the Bible.

Dr. Raymond had what biblical scholars generally lack—imagination. To him the Bible was literature, and the rules of philology and grammar are not of themselves sufficient for the interpretation of literature. To understand Milton or Browning one must know something more than the old Anglo-Saxon language or the rules in 'Murray's Grammar' or even those of 'Blair's Rhetoric'. Dr. Raymond could see the truth in poetry or fiction as well as in history; and when he was through with his careful analysis of a historical passage, he could himself visualize it and so portray

it that others could share his vision. He was not contemptuous of traditions or conventions, but he was not bound by them. He was not eager to reject a view because it had been common, but neither did its commonness prevent him from rejecting it if better scholarship showed it not to be true. This quality made him a rare interpreter of Scripture and equipped him for two other services which he rendered to and through Plymouth Church.

Until the death of Thomas G. Shearman called him to the superintendency of the Sunday-school, Dr. Raymond carried on a large and interested bible-class. But perhaps more important still was the spiritual service he rendered in his prayer-meeting talks. These were apparently spontaneous, but his biblical scholarship, his vivid imagination, his genial humor, and his warm heart made them always interesting and often of unique value. I wish that they could have been taken down and published in book form. They would have contributed a very real addition to our devotional literature. They never were taken down, and though I do not think that the presence of a short-hand writer in the prayer-meeting would have made any difference to Dr. Raymond, it would have stricken with dumbness some of those accustomed to take part in what was a very free family gathering, and he would have been one of the first to oppose such a plan if it had been proposed.

It would, however, perhaps, be possible to make a selection of his Christmas stories. Every Christmas he wrote and read to the Sunday-school a story, a service which he rendered without a single break for 50 years. The last story read a few days before his death was his fiftieth. These were not stories with a moral; nor were they mere contributions to the entertainment of an hour. The moral was in the story, not appended to it nor drawn from it. The fiftieth I have not seen; the forty-ninth—Christmas 1917—was an exciting story of adventure, sure to inspire in the boys and girls who heard it the spirit of courage and of patriotism.

One other aspect of Dr. Raymond's church life I have left to the last, because it is the most important; and yet about it I can say practically nothing, because about it I know nothing except its existence. His house was almost as much a pastor's house as mine; indeed, I am inclined to think he did more pastoral work than I did. His home was a spiritual centre. Go there almost any evening except Friday, when he was always at our prayer-meeting, and I would find some young people, perhaps only one, perhaps half a dozen, perhaps in frolic, perhaps in group conversation; but quite as probably, one talking quietly with Dr. Raymond and another as quietly with Mrs. Raymond. Both husband and wife had the rare faculty of drawing out the secret experiences of the young, even of the shy. Of course, I did not know what was the subject of these personal conferences, though sometimes those who had been put

on their way told me gratefully afterward, and occasionally Dr. Raymond would consult with me respecting the counsel he had given, or would give, in some exceptional case. In my correspondence I find the copy of a long letter written one Sunday afternoon by Dr. Raymond to an inquirer, dealing in a spirit of perfect frankness and fairness with that ever-perplexing question: How can we reconcile the existence of sin and suffering with faith in a just and benevolent Creator? This letter, written to one perplexed soul, is quite long enough to be a sermon and more thoughtful than many sermons. Dated shortly after I came to Plymouth Church, I suspect Dr. Raymond sent it to me, that I might know the sort of questioning I would have to meet in the minds of my congregation. From it I quote one paragraph because it illustrates not only the thoroughness of his thinking and the conciseness of his style, but also a fundamental axiom in his religious philosophy—the moral freedom of man.

The possibility of wilfully wrong choice, not the choice itself, is the necessary result of freedom. The penalty of sin is not confined to the sinner. Pain is not punishment. Half our difficulty arises from our persistent belief that it is so, or ought to be. We talk about people suffering more than they deserve; we want to know why the innocent should suffer with or for the guilty. "Who sinned, this man or his parents, that he was born blind?"—and we can't accept the answer, "Neither". All the physical, and even mental pain of the world is entirely separate from guilt. I doubt whether guilt as such incurs even spiritual pain. The penalty is not pain, but death, and the pain comes when the benumbed spiritual life begins to prickle as it wakes up.

I shall not attempt to add to this already long paper any analysis of Dr. Raymond's character. I have never been inclined to practice vivisection on my friends either for my own entertainment or for the entertainment of others. But I may jot down here a few features in his character partly illustrated by some extracts from his letters.

He was an omnivorous reader. Everything was grist that came to his mill, but not everything was equally profitable. He did not grind up the cob with the corn. He knew how to keep what was worth keeping and to throw away the worthless. His mind was not stored with unassorted and useless knowledge. What he knew he transformed either into experiences or into tools that he could use as needed. "He was always an eager listener", says the Rev. Robert E. Carter of Washington, Connecticut, which was Dr. Raymond's country home, "No minister ever had a better listener than we ministers had in Dr. Raymond. He was a genius at listening; it almost seemed to me, in our little church, that he listened out loud, we were so completely conscious of his following our thought or going ahead of it".

And he listened as eagerly when he disagreed with the speaker as when he agreed with him. Mr. Beecher was brought up in the old individualis-

tic school of political economy and sociology. My studies had led me in a different direction, toward a larger power of government, and toward a larger function of government. In the sociological sphere I was running counter to the sentiment of the church, and to the opinion of Dr. Raymond. But the differences in opinion never interfered with our friendship or weakened his support for his pastor. His attentive listening and cordial support gave me courage when without such inspiration from him and others I think my courage would have failed.

Eager to receive, he was equally eager to impart. His work was his joy. I do not think he had to spur himself to work; generally he had to hold himself back from it. His mind was fertile and produced spontaneously. Perhaps his habitual good health was partly due to this spontaneity, but it was partly due to a wise conscientiousness in making his activities subject to the laws of health. At one time I had written him a cautioning letter, fearing from what I had heard that his enthusiasms were leading him to overtax his physical machine; he replied:

I can almost rejoice in my infirmities, if they call forth such precious testimony of affectionate solicitude as your note of yesterday. But I cannot buy the luxury of sympathy at the price of deceit; and so I hasten to tell you that I am in the hands of Dr. G.—, who is a close questioner and observer, and as prudent a counselor as one can well be, without becoming an alarmist. . . . Let me assure you that I do honestly hold my body as a trust, and watch it as an engineer watches his engine, not satisfied without knowing the cause and meaning of every squeak in the machinery. On the other hand, I confess that I do not call in a machinist to take apart and tinker the rods and valves on every possible occasion. My personal experience is that health is the cure for illness—and that too much doctoring is almost as bad as too little.

Spontaneity of service was characteristic not only of Dr. Raymond but of his whole family—indeed it was characteristic of Plymouth Church. Rarely did I ask any member of the church for any specific service and receive a qualification or an excuse. I venture to turn aside from this purely personal narrative to insert here a letter of Dr. Raymond's son, Alfred, not now living, for nothing from his father which I find among my papers better illustrates this spirit, equally characteristic of father and of son, which made Plymouth so truly a "working church".

February 25, 1891

My dear Dr. Abbott;

I have just received your kind invitation and the enclosed card of topics. Yes, indeed, I accept with gladness and thank you for asking me! I am a young disciple and have not yet been subjected to the deeper and more trying experiences of the Christian life, except through sympathy. But I have experienced the joy and sweetness of Christ's love, and I should be false and unworthy if I could not testify, however humbly, to its richness and power. May I, then, choose March 13, 'Christians not Orphans', John xiv: 15-31?

Yours sincerely

ALFRED RAYMOND.

Humor is not only oil to reduce the frictions in the machinery of life and make it run smoothly, but it is also a lightener of individual burdens and a great preservative of health. "A merry heart doeth good like a medicine", says the proverb. Dr. Raymond combined with his spirit of service, his careful scholarship, and his energy in action, a merry heart. The American Board of Foreign Missions had become in 1891 a storm centre. Its foreign secretary refused to send any candidates abroad unless they were quite sure that no one would be saved in another life who had not in this life heard of Christ and accepted Him. The Board sustained him. It was a self-perpetuating board and the only way in which this policy could be changed was through public opinion. Some former contributors were inclined to withhold their contributions until the policy of the Board was changed. That was the view which Dr. Raymond and many in Plymouth Church were inclined to take; others, with whom I agreed, wished to continue to give a liberal support to the missionaries in the foreign field and trust that public opinion within and without the church, would inspire in the Board a more liberal theology. As a result of some correspondence between Dr. Raymond and myself I received from him the following characteristic letter:

November 30, 1891

My dear Dr. Abbott;

After a prolonged struggle with my conscience, it has occurred to me that I can justify myself in sending you the within check of \$50 for the American Board, provided I stand ready at the same time to give another \$50 to some holy and zealous Brahmin or Buddhist who will undertake to preach against the doctrine of damnation, and not oppose salvation. As I don't know any such apostolic heathen, I can keep the \$50 until he turns up—which conscience admits to be an incidental advantage worth consideration.

Yours truly,

R. W. RAYMOND.

The habit of seeing the humorous side of even the most serious problems of life is probably temperamental; but it was certainly deliberately developed by Dr. Raymond.

"If there be joy in the world", says Thomas à Kempis, "certainly the man whose heart is pure, possesses it". Dr. Raymond believed that there is joy in the world and that God means his children to possess it. Joy which the Puritans regarded as a temptation, if not a sin, Dr. Raymond regarded as a duty. Not to joy in the Lord, he thought the sign of an ungrateful heart; to joy in the Lord, the sign of a filial heart. He believed in the customary recreations of American society, such as music, dancing, cards, and the theatre. He was as good a play-fellow in vacation as he was a work-fellow in term time, but he habitually took his pleasures in moderation, and it cannot be truthfully said that he was always equally moderate in his work.

But instead of trying to speak for him, let me give him the opportunity to speak for himself. Among my letters is a long typewritten one of eight pages, sent to Mrs. Abbott in 1889, in which he gives some account of an 'outing' enjoyed by him and his wife in an excursion through the Far West. In company with congenial companions—a trip in which "the petty cares of baggage, quarters, time-tables, tickets, meals, etc., were largely taken off our minds by our paid agents and servants; and the fatigues and inconveniences of long railroad-travel were transformed into rest and home-comfort by our special car, the beautiful, commodious, and beloved *Iolanthe*". From this letter I quote the following frank expression of one phase of Dr. Raymond's character:

My four young men, gallant and active and full of fun, with the constant undertone of ready unselfish service and chivalric devotion which makes a boy-gentleman irresistibly charming, were not more youthful in their high spirits than the oldest of the company. What mooning poet wished he were a boy again? What mad adventurer wasted his age in seeking the fountain of youth? The thing is so easy if one only knows the secret. If you want to be a boy again, why, just be a boy again—and behave accordingly! If you would drink from the fountain of youth, take one step up stream, and there it is. Get right down on your stomach and drink!

These are not mere figures of speech. I know by personal experience, as to temperaments like my own, and now once more by this exceptionally thorough confirmatory observation, as to temperaments of all kinds, that it is possible to lay care aside like a garment, and to renew the soul by a baptism of youth. What if we do have to put on our clothes again? Shall we therefore never bathe?

I yield to the temptation to add here one other paragraph from this letter because it illustrates a fundamental phase of Dr. Raymond's experience. He never thought that piety and gaiety were incongruous. He felt toward his Father in heaven as he wished his children to feel toward him and was as ready to see humor in a prayer-meeting as to see stupidity in a theatre, if it were there.

Friday night, the Deaconess and I went down to prayer-meeting. There were 30 or 40 present. Mr. B. led the meeting with simplicity and appropriateness, and spoke on the subject of the Sunday-school lesson, which was Samuel and Saul. When there came the 'dreadful pause', and nobody would speak, I got up at last and by an amazing *tour de force* (for which I quite admire myself) managed to connect Saul with the Grand Canyon of the Colorado, after which 'there was fire-works' for a while. Brother S., who followed, had a hard time getting *his* thought hitched on to my rear platform (the *Iolanthe* usually tolerates no attachment to her observation balcony). But he made the connection, with bold *naïveté*, somewhat thus: "When I hear about such things as Brother R. has described, and think of the wonders I have seen myself—boulders, and—and—other such things, I feel to exclaim, 'What a great country this is—and what are we doing to win it to Christ?' Brethren, it seems to me sometimes as if we were not doing as much for Christ as we might be a-doing, considering what a great country we live in; etc., etc." The vision of Brother S. wandering through the vast solitudes of the Grand Canyon, like a roaring lion, seeking whom he might convert, touched me—on the funny-bone of my soul. Well, after S. had redeemed the Grand Canyon as far as was temporarily practicable, T. S.

redeemed the meeting with a lovely prayer that mixed heaven and earth, souls and scenery, canon and canyon in just the right kind of blessed confusion; and afterward there was lots of handshaking, and it was good to be there.

The most distinguishing intellectual characteristic of Dr. Raymond was his versatility; his most distinguishing spiritual characteristic was his loveliness. In Plymouth Church we never thought of his degrees; he was never called Dr. Raymond; he was 'Ros Raymond', or simply 'Ros'.

But what is it that makes a human being lovable? Paul says that "for scarcely for a righteous man will one die; yet peradventure for a good man some would even dare to die". We all recognize the difference between a righteous man and a good man; we respect the one, we love the other—love him despite his faults—yes!—love him often because of his faults. But what constitutes the difference? Why did the American people call Theodore Roosevelt, 'Teddy'? They never called William McKinley, 'Billy'! Why did they call Abraham Lincoln, 'old Abe', though he was only 56 years old when he died? They never called James Buchanan, 'old Jim', though he was 70 years when he retired from the presidency. Jesus Christ said, "And I, if I be lifted up from the earth, will draw all men unto me". Is the secret of loveliness the spirit of loving, rejoicing, self-sacrificing service?

Whatever that secret is, 'Ros' Raymond possessed it. It was this loveliness which made him a leader in the church. When he rose to speak we wanted to agree with him. When he proposed a plan we wanted to adopt it and make it succeed. His plans were generally wise; in his speeches he always had something to say. If his plans had generally miscarried and if his speeches had been empty sentiment, he would have ceased to be a leader; but it was the quality of goodness pervading the speech, the quality of goodness inspiring the plan, that made us eager listeners in the one case and eager followers in the other.

This loveliness was the characteristic of his piety. It was without awe but not without reverence. What do I mean by that? Both look up—awe with fear, reverence with love. Dr. Raymond illustrated the text "Perfect love casteth out fear". He had little occasion for the doubtful virtue of submission; for perfect consecration never has occasion to submit. He who can say with the Psalmist, "I delight to do Thy will O God", does not submit to that will. Whatever the service to which his Father calls him may cost, he delights to do it; the greater the cost, the greater the opportunity to show his love to his Father. Dr. Raymond's spirit of life-long consecration to his Father's will found characteristic expression in a favorite phrase of his: "If you cannot do what you like, then like what you do". The spirit of consecration to the will of another makes tasks joyful that would otherwise be difficult, disagreeable, or dangerous. It enables us to walk through the Valley of the Shadow of

Death, because the Father summons us and companions us. It enables us to glory in tribulations, because His spirit is within us and His love is shed abroad in our hearts. To this expression of consecration to the Father's will, which I believe to be the key-note to Dr. Raymond's character, he has given expression in a lyric which he wrote for the Plymouth hymnal, and which was one of our favorite prayer-meeting hymns. With that hymn I bring to a close this simple, fragmentary, sincere tribute to my dear friend and inspiring fellow-pilgrim and fellow-worker.

O Thou, who art inspiring
My yearning and desiring,
And hearest always when I pray!
Hear only, whatsoe'er I say,
"Dear God, Thy will be done,
And Thine alone!"

I could not joy in praying,
My heart before Thee laying,
Did I not know I cannot move
The wiser purpose of Thy love!
Dear God, Thy will be done,
And Thine alone!

Such dread, my faith o'ertasking,
Would silence all my asking,
How should I dare a single hour
To borrow Thy almighty power?
Dear God, Thy will be done,
And Thine alone!

Let not my selfish crying
Disturb Thy love's replying!
I shall not mourn the things I miss
If Thou but make me sure of this;
Dear God, Thy will be done
And Thine alone!

Reminiscences

BY JAMES F. KEMP

Doctor Raymond graduated at the Brooklyn Polytechnic Institute in 1858, and was then somewhat over 18 years of age. The Polytechnic Institute is the old-time school for the higher education of the boys and young men, especially in that portion of Brooklyn known as the 'Heights', the old part of the city, on the hillside above the East river and between the two early ferries, Fulton and South. In it was, and is, Henry Ward Beecher's world-famous Plymouth Church; in its earlier days, just as now, the centre of liberal thought; of great-hearted, generous living; and of out-spoken patriotism. In time, as is related elsewhere in this volume, Dr. Raymond took his place in the congenial church community and contributed his share to the maintenance of its traditions. By way of contrast, a few blocks away was the church of the Rev. Dr. Henry M. Storrs, only less famous than Mr. Beecher. Dr. Storrs was scholarly, formal, correct, and orthodox. His church was called the Church of the Pilgrims, so that the interesting and striking phenomenon was presented of two absolutely contrasted colonies of New England religious life and thought, each presided over by a graduate of the same little Massachusetts college, and each planted in the old Dutch settlement of Brooklyn. In the Polytechnic Institute the sons of Brooklyn's families were fitted for college, and, as is not so generally known, were also in fewer numbers, carried along to degrees in arts and engineering. Doubtless for good and sufficient reasons, Rossiter W. Raymond, 18 years of age, turned away from the Polytechnic and from the other institutions whose courses of education almost without exception in those days were made up of Greek, Latin, and mathematics, and sought the training in science to had in the universities of Germany.

The contrast between the closing years of the 'fifties and the conditions today in Germany is nothing less than tragic. Then Germany typified to the eager young minds on this side of the ocean the land of honest, industrious folk, profoundly musical, idealistic in temperament, and untrammelled in their search after truth amid the *lehrfreiheit* of their universities. Bismarck had not yet started by his wars of the 'sixties, and above all by the one of 1870, the simple and honest folk of earlier days on the course of evolution to the Hun and the Boche of today. When, therefore, we picture to ourselves the educational surroundings into which with high hopes and bright anticipations went the wonderfully versatile mind and engaging personality of young 'Ros Raymond', we must banish from our minds the sickening exhibition of recent years.

In 1859 we find him matriculated in the University of Heidelberg, the one which more than any other typifies the joyous years of youth, filled with its bright ideals for the future.

Alt' Heidelberg Du feine—
Du Stadt am Ehren reich—
Am Neckar und am Rheine—
Kein and're is Dir gleich.

We may not easily reproduce in its entirety the learned faculty of those days, but we do recall that in its lecture-rooms the famous Bunsen taught, best known as chemist, but really no less influential as geologist. In the decade of the 'fifties Bunsen had made his famous journey to Iceland and had studied not alone the geysers, so as to leave us his theory regarding their action, but also the vast exhibition of volcanic phenomena and igneous rocks. As a result, and aided by the many analyses of igneous rocks from Asia Minor by Abich, he developed his views of two fundamental magmas, the normal-trachytic and the normal-pyroxenic, from which by mixtures of different proportions of each, and by the fusing-in of sandstones at the one extreme and of limestones at the other, all the varying grades of igneous rocks were supposed to be developed. We may well imagine the eagerness with which broad generalizations such as these would be grasped by so absorptive a mind as that of our young *Herr Studiosus Rerum Naturæ*. In 1860 Raymond moved to Munich, the 'comfortable' city, as its inhabitants like to describe it. Franz von Kobell was then professor of mineralogy—and of him 25 years later Professor Groth, his successor, said to me that von Kobell was "poet, painter, and musician, as well as mineralogist". If so, he must have been a sympathetic teacher of young Raymond, who was himself, if not painter, at least poet and musician.

Although we have in mind in this sketch to stress especially Dr. Raymond's work in geology and related branches of science, yet perhaps for a moment we may leave the straight track for a side-path. In the late 'sixties and early 'seventies I was a small boy up-town in Brooklyn and was sent to Sunday-school by a pious mother with the same regularity with which Sunday came around. Along with other boys of like age I used lustily to sing the Sunday-school hymns. They formed, indeed, a very important part of the exercises. There were two that especially appealed to us and that we most of all preferred to have the superintendent give out. The words of one began, as I recall:

Morning red, morning red,
Now the shadows all are fled,
Now the sun in cloudless glory
Tells anew the wondrous story.

The air was a simple and beautiful one, like a folk-song, which had come down through generations.

The second air was more in the nature of a chorus and when once it was started, it fairly sang itself. The boys liked it better than any other hymn set for them. The words ran:

Far out on the desolate ocean—
The sailor sails the sea—
Alone 'mid the night and the tempest
Where many dangers be.

Yet never alone is the Christian
Who lives by faith and prayer—
For God is a friend unfailing
And God is everywhere.

Both these hymns were written by R. W. Raymond, and probably not a few other members of the Institute in this way first learned to know the name that afterward became much more familiar, when they took up mining engineering and geology.

In 1885-'86 I was working in geology in the university at Munich, and along with my old college-mate and dear friend 'Billy Clark', more generally known as the late Professor William B. Clark of Johns Hopkins, I went to the meetings of the University Geological Society, whose membership consisted of professors and students. The professors would attend for the early scientific part of the evening, and then go home, while the students remained to 'rub' a salamander or two of the beverage which has made old Munich famous. One evening when the latter exercises were well along and the young Bavarians had begun to feel just a little subdued and melancholy, they all started singing an old-time student song:

*Ich weis nicht was soll es bedeuten
Dass ich so traurig bin*

The air had an extraordinarily familiar ring. I racked my brains to recall where and when I had heard it. And then like a flash I was back on the benches of the Sunday-school on Washington avenue, Brooklyn, singing with all my might along with other little kids,

Far out on the desolate ocean
The sailor sails the sea, etc.

And I knew where Dr. Raymond had found the air, for had he not been a student at Munich 25 years before.

At the close of his year at Munich, Raymond moved to the time-honored Mining Academy at Freiberg and added his name to the rolls of the Anglo-American Club, where may be found the signatures of so many of the mining engineers and geologists who came to the fore in the United States in the next thirty years. Bernhard von Cotta was then Professor of Geology and had just brought out his invaluable treatise on 'Ore Deposits', which was translated into English by Frederick Prime,

Jr., and published in New York ten years later. Professor von Cotta was notable as a genial and kindly man, and one who took a warm personal interest in his students. Of him, and of Professor Gaetschmann in mining and the author of an excellent text-book, Dr. Raymond used to speak in warm appreciation in later years.

But troublous times had developed in the home country, and so, at the close of his year at Freiberg, filled with the lore of mining and geology, Dr. Raymond returned to New York, and, as we all know, enlisted in the army and was on the staff of General Frémont.

In 1864, on retiring from the service, he began practice as a mining engineer and metallurgist, as partner in the firm of Adelberg & Raymond. The German education of both members of the firm led to connections with others of similar training which are worthy of remark. Hermann Credner, later Professor of Geology in the university of Leipzig and Director of the Geological Survey of the important mining kingdom of Saxony, was in their employ during his *wanderjahre* in America. Our revered and beloved fellow-member in the Institute, the late Anton Eilers, was with them. At this time an endeavor was made to establish a body of mining engineers of unquestioned standing who could be called upon for thoroughly reliable reports amid the speculation following the close of the Civil War. The members of the American Bureau of Mines furnish an interesting list today. The Bureau issued at least one valuable publication, a study and report upon Ducktown, Tennessee, by Trippel and Credner in 1866. Dr. Raymond also found congenial vent for his irrepressible intellectual activity in editing the forerunner of the 'Engineering and Mining Journal', and in recognizing in its pages science, especially geology, as well as engineering.

But his great service during these years to mining and geology arose with his appointment as Commissioner of Mining Statistics, succeeding J. Ross Browne, by whom the first two reports were prepared. In the reconstructive period following the Civil War, a period which has so many interesting parallels with the one in which we now live, Congress had turned its attention to the resources of the Rocky Mountains and the Pacific Coast. It sought to spread reliable information and gather statistics and descriptions that would bring support for the development of mines. The precious metals were the ones naturally and inevitably sought in these remote communities, but indications of copper and lead were not lacking, nor was it so very many years before the old Germania smelter was built in the Salt Lake valley to treat the lead-silver ores of Bingham and the Cottonwoods.

From 1868 to 1876 we see Dr. Raymond spending six months in each year traveling up and down, back and forth, across the almost inaccessible Western country gathering up the accounts of mines and prospects and systematizing them by Territories and States, and under each by

mining districts. In some instances the notes and descriptions remain to this day almost the sole records of many of the camps; and to them the engineer, on starting for examinations, must often refer. Only a few years ago I desired to look up all the old records on Gold Hill and Clifton in western Utah, before going there for the study of some interesting contact-zones, and could find no records of the camps except in Raymond's reports. Many miles of desert cut them off from the larger settlements; but many miles of desert had not prevented the energetic Commissioner from securing and recording the main facts of the prospects. One only needs to picture the endless and almost trackless billowy mountains of Idaho; the lofty ranges of Colorado; the burning deserts of Utah, Nevada, and Arizona; the remote valleys and peaks of Montana; and the vast extent of the Sierra Nevada and the Coast ranges, in order to realize that Jason and his Argonauts, searching for the golden fleece, had a very easy task compared with that of the U. S. Commissioner of Mining Statistics west of the Rocky Mountains.

Of course, there were helpers. Chief among them, and the principal worker in Arizona, was Anton Eilers, who brought to the task the traditions and training of the old mining academy of Clausthal, even as Dr. Raymond did those of Freiberg. Now, when we read the beautiful tribute paid by Dr. Raymond to his old friend at the memorial services, the account of which Karl Eilers, the son, has so thoughtfully and appropriately preserved for us, we realize that the tribute was based on long and intimate association.

The reports of the Commissioner were not all made up of the details of mining camps. The closing pages of each volume contain papers of general interest and of scientific or technical value. His very first report, while officially devoted to the regions west of the Rocky Mountains, has a paper by James W. Taylor on the 'Mineral Resources East of the Rocky Mountains'. In the volume for 1869 is an unsigned one, presumably by the Commissioner himself, on the 'Relations of Governments to Mining.' It is naturally followed the next year by one on the 'United States Mining Law', in which Dr. Raymond compiled the draft of a bill. He also contributed an article on 'Mineral Deposits'. In the report for 1871 we find a paper on the 'Origin of Gold Nuggets', and in the one for 1872 a contribution by Dr. Raymond himself on 'Electricity and Rocks,' read originally before the Troy meeting of the Institute in November 1871. The report for 1873 contains a geological map of the United States prepared by C. H. Hitchcock and W. P. Blake for the census reports of the time. In the volume for 1875, the 'Geology of the Sierra Nevada in Its Relation to Vein Mining' is discussed by Amos Bowman, after an introduction by Dr. Raymond, who speaks sympathetically of the timeliness and value of generalizations such as those set forth. In the last of the volumes, that for 1876, the impressive review by Abram S. Hewitt of

'A Century of Mining and Metallurgy in the United States' is re-printed; it was one of the contributions that marked the celebration of the first hundred years of the Republic. A number of technical papers brings the volume to a close.

With the completion of the eighth report the series was discontinued under its old name, and the field was afterward covered by the annual reports of the Director of the Mint. In large degree, however, 'Raymond's Reports' were also the forerunners of the annual volumes on 'Mineral Resources' of the U. S. Geological Survey which began in 1882—six years later.

Beginning with 1870, and for 12 years thereafter, Dr. Raymond was lecturer on economic geology at Lafayette College, where his friend Dr. Drown, the secretary of our Institute in its early period, was professor of chemistry. In one year, we learn, Dr. Raymond gave the entire course in mining engineering, a branch that had received much attention at Lafayette from the proximity of the anthracite mines. The connection with Lafayette gave Dr. Raymond the title of 'Professor', by which we sometimes find him addressed or described. Surely for the discussion of ore deposits and useful minerals to classes of young men, a teacher has rarely brought such preparation as had been gained by Dr. Raymond in his European training, his years as Commissioner, and his varied practice as an engineer.

In 1871 the American Institute of Mining Engineers was organized with Dr. Raymond as one of its moving spirits. We understand at this late date, after nearly fifty years, that he wrote its constitution, and we are interested to observe that the members were to be "all professional mining engineers, geologists, metallurgists or chemists, and all persons actively engaged in mining and metallurgical engineering, geology or chemistry". Geologists and geology were obviously in the foreground of Dr. Raymond's thoughts when he formulated the professions from which the Institute would draw its membership, and the science had warm sympathy and much fostering care from him in all his connection with the subsequent development of the society. The greater number of his own special contributions to the Transactions, beginning with his paper in the first volume on the 'Geographical Distribution of Mining Districts in the United States', are geological. The most important and far-reaching in their influence are the series beginning with the review and summary of the Eureka-Richmond case (Trans. VI, pp. 371-393, 1879), and discussing the apex law, its applications and successive interpretations. This pioneer and precedent-establishing litigation led to a broad and non-technical interpretation of the three-fold phrase of the statute, 'vein, lode, or ledge', such that even a characteristic geological formation, with recognizable boundaries such as a limestone associated with ores, would come under the meaning of 'lode', or something that *led*

the miner in his search for ore. Probably there is no escape from this interpretation of the law, much as we may deplore the uncertainty cast upon titles, the necessity of introducing geological interpretations, and the endless series of litigious disputes which still stretch away into the future. Since retroactive legislation is out of the question, we realize more and more strongly that combinations of conflicting interests into large operating companies furnish the reasonable way out.

To Dr. Raymond's keen analysis and ability to go to the heart of a problem, and to his preparation both on the legal and the scientific side, we owe the invaluable list of papers in the Transactions in which from time to time he followed up the evolution of the apex decisions and commented upon them. His years of travel as Commissioner and his personal familiarity with Western camps, habits of thought, and customs made him peculiarly fitted for the discussion of this theme.

The Chicago Exposition of 1893, celebrating, although a year late, the fourth centenary of the discovery of the Western World, furnished a fitting setting for a great meeting of the Institute. By a fortunate coincidence a year or two before, Franz Posepny, the veteran Austrian mining geologist, had sent to the secretary of the Institute a remarkable manuscript in German, on the 'Origin of Ore Deposits'. For ten years Posepny had lectured in the Mining Academy at Pribram, Bohemia. In the late 'seventies the investigations of Professor Fridolin Sandberger, of the University of Würzburg, upon the relations of wall-rocks to the minerals of their veins, and his development of strongly emphasized support for the old-time theory of 'lateral secretion', had aroused much interest in the general topic of the origin of ores. The Freiberg geologists, represented in this instance by Alfred Stelzner, the professor at the Mining Academy, were naturally opposed to these views and supported the theory of uprising solutions. Face to face every day with deep fissure-veins in several successive series, each connected with an outbreak of igneous rocks, the Saxon geologists even as early as Agricola had favored these views. The quaint and curious thesis of Werner in the closing years of the 18th century, that the fissures had been filled by precipitation from an overlying ocean, was but a temporary departure from the well-nigh inevitable interpretation. Hence, between Sandberger the 'lateral secretionist' on the one side, and Stelzner the "infiltration ascensionist" on the other, a vigorous controversy raged. As a test case Pribram was selected, and some special investigations were conducted in its deep shafts and drifts. So much interest was aroused that Posepny was in the end called from the Austrian mining-school at Leoben to lecture and study for ten years at Pribram. The essay that resulted was sent in the original German to Dr. Raymond for the Transactions of the Institute. From its original draft, written, as he has told us, in script like a copper-plate engraving, he transcribed it into English, which we may add was written

in his hand in script no less like copper-plate engraving than was Posepny's. Few authors in a foreign tongue have had translators at once so gifted with the command of a subject and with such grace and felicity of expression. The result was not only an interesting summary of a skilled observer's views, but a masterpiece of lucid English.

Around the essay gathered a series of extremely valuable and important contributions and discussions, accumulated under the guiding hand of the secretary of the Institute. All were afterward edited and grouped as a whole in the separate volume brought out by the Institute and now on the book-shelves of every mining geologist. To Dr. Raymond we owe a great debt for the preparation and issue of this book.

Then followed fifteen years extremely fruitful in new ideas. The part played by igneous phenomena, whether in the way of direct magmatic crystallizations or of after-effects; the contact-zones and their elucidation; the actual processes of replacement and the changes in wall-rocks; the phenomena of secondary enrichment; the restriction in depth of the meteoric ground-water—one fundamenal question after another crowded to the front. Dr. Raymond, sitting in his secretarial office of the Institute and with his encyclopedic grasp of what was passing, was fully alive to the interest and importance of it all, and conceived the idea that a second volume under the immediate oversight of Samuel Franklin Emmons would alone adequately summarize the rapid evolution of ideas. At Dr. Raymond's request Mr. Emmons undertook the task, selected the papers, wrote the very valuable introductory review, and alas, passed away just before the manuscript went to press. The volume thus became the Emmons memorial volume, and took its place on every mining geologist's book-shelf beside the Posepny volume, whose second edition had also become a memorial. Both these volumes we owe primarily to Dr. Raymond, and I may here express the debt that geology as related to the problems of mining owes to him.

In his editorial capacity as secretary of the Institute and in his contributory relations with the 'Engineering and Mining Journal', Dr. Raymond was brought into personal connections with many young writers on engineering themes and scientific subjects, not alone on geology. A word of acknowledgment may be recorded of the help and encouragement so often and so generously extended to them. Not only in the subject-matter, but in grace and lucidity of expression, are not a few indebted to him. Technical education does not always add the gift of clear exposition to soundness of knowledge. Sometimes the man of action seems thereby unfitted for imparting to others the fullness of his own command of a subject. Sometimes, however, the conciseness and beauty of the mathematical and exact sciences that are the basis of engineering, exercise their proper influence on the habits of mind of him who has been trained in them. F. Hopkinson Smith, who could write

the most charming tales of American life, and transfer to canvas, with a facile and delicate touch, the beautiful vistas that caught his eye, was an engineer and builder of lighthouses on dangerous and well-nigh inaccessible reefs: Frank Dempster Sherman, whose delightful verses have charmed many thousands of readers, was my own class-mate in the engineering school, and taught the calculus and the principles of engineering construction to students of architecture: Clarence King, mining geologist and engineer, was a writer of almost unequalled charm and a judge of works of art of exceeding discrimination and skill: a dozen captains of industry could be named who have developed in later life, as they have acquired the means with which to gratify their tastes, a similar sound and discriminating critical taste in works of art: Rossiter Worthington Raymond, with all his grasp of engineering and science, amid his busy life in active practice and in the office of the Institute, was story-writer, poet, musician, and was responsive to the call of what we idealize as Art.

But he had also the saving grace of humor and could see the amusing side of things. One characteristic incident will bring to a close this little tribute.

In the final decade of the eighteen hundreds, there existed in New York a little dining-club of 25 scientific men from the colleges and schools of the city and vicinity and from civil life. It was called the Lunar Society, and during the eight working months of the year had a monthly dinner on the evening of the full moon. The club had been organized by H. Carrington Bolton, the chemist, who had written a life of Priestley, the discoverer of oxygen, the very interesting Englishman, half theologian, half man of science, whose later years were passed and finally closed at Northumberland, Pennsylvania. Toward the end of the seventeen hundreds, Priestley had lived at Birmingham, England, and along with Boulton and Watt, the builders of the steam engines of the day; William Murdoch, the inventor of gas-lighting; Erasmus Darwin, the grandfather of Charles Darwin; and a few others of less extended fame, had formed the original Lunar Society, which perforce had dined at the full-moon because otherwise they could not see their several ways to their homes. The presiding officer in each of these clubs, although a century apart in time and three thousand miles apart in meeting places, was called the Man-in-the Moon. At the New York club, after a good dinner at Clarke's famous restaurant on Twenty-third street, the Man-in-the-Moon called upon the members in turn, beginning on his right, for some bit of interesting experience that had come up in their scientific work or reading since the last dinner. Discussion usually ensued of an exceptionally stimulating character, and seldom was a topic mentioned without developing some one at the table who could speak upon it with authority.

To one of the dinners I took down a copy of that rather rare book, the first edition of Thomas Macfarlane's 'Coal Regions of North America',

published in 1873. The last chapter before the appendix is devoted to Nova Scotia. The author seems not to have visited Nova Scotia himself, but from the writings and reports of others he had gained a most unfortunate impression of the coal seams. His closing paragraph reads as follows:

"To one who takes only a utilitarian view of the Nova Scotia region, there must occur a feeling of regret that in some of its localities its seams of coal are so unfortunately subdivided into thin sheets too small to work, and in other places disposed in masses inconveniently large, uncertain and irregular in form. But if we take a higher and more thoughtful view of the subject, we will observe the malevolence of that Providence which, in its apparent anger, has submerged beneath the ocean so much that might have benefited mankind, or caused it to be eaten away through countless ages by the action of the waves, leaving only poor fragments to tell us of the much larger portions that have been removed. Hence we cannot doubt but that the earth in its rocks, as well as its soil, was cursed for our sake, and that far back in the geological ages there was built up by a Being, who saw the end from the beginning a mutilated planet as a fit habitation for a fallen race."¹

The members of the Lunar Society were greatly entertained by the paragraph, and Dr. Raymond, who was a member of the society, borrowed the book and took it home with him. The views advanced were naturally especially interesting to a member of Henry Ward Beecher's church. A week or two afterward there appeared in the 'Engineering and Mining Journal' one of the Doctor's inimitable signed editorials, in which he merrily commented on the passage, and showed how naturally a supporter of one type of orthodoxy in Pennsylvania could understand how the Blue Noses of Nova Scotia, supporters of another type, had come under the wrath of the Deity. He finally made the point that the argument had not been carried to its legitimate conclusion, because the author had apparently overlooked the fact that in New York State, where there was much abominable heresy, there was no coal at all!

¹ The paragraph was edited out of the two subsequent editions of this extremely valuable and important treatise.

Reminiscences

By T. A. RICKARD

Early in 1891, on my way from New Zealand to France, whither I had been called by my father to take charge of a group of mines near Allemont, in the department of the Isère, I called at the office of the American Institute of Mining Engineers, which then was domiciled at 13 Bowling Slip, below Wall Street. My purpose in calling was to make the acquaintance of the secretary, Dr. L. J. [?], with whom I had been in correspondence, while in Australia, by reason of my first contribution to the Transactions, a paper on the Morgan mine presented at the Cleveland meeting in June. On being ushered up stairs into a cheerful room overlooking the water, I found two gentlemen in conversation. One of them, wearing a silk [?], arose to greet me most politely and, in the absence of shaking hands, asked: "Which one are you: Colorado, California, or Australia?" I knew what he meant; I wished to know of the [?]. Rickards I was; for at that time our family had no representatives in the Institute. I answered promptly, "Australia," whereupon he said: "Then let me introduce you to Mr. Emmons. We have just been discussing the origin of the masses of kaolin in the Brown Hill lode. What is the source of the kaolin?" I replied: "It is a product of decomposition from the [?] in the valley, which is gneiss." Thus I made my first acquaintance with two men whose friendship I am proud to have won later, for I did not begin to know them intimately until five or six years subsequent to this first meeting.

From France I sent to Dr. Raymond, for the Transactions, my contributions on 'La Gardette: The History of a French Gold Mine' and 'The Adigo Goldfield', the latter the first of three papers on the famous mining district in Victoria, Australia. These were presented at the meetings in October 1891 and February 1892, respectively. Within three years—1892 to 1894—I contributed nine papers to the Transactions. This literary activity was due in no small measure to the encouragement given by the secretary, in whom I found not only an editor of extraordinary ability, but a friend rich in stimulating helpfulness.

My second call at his office was in January 1892, about nine months after the first visit. I had come from France to New York to serve as assistant to the late George Cowland, who was acting as consulting engineer to H. H. Warner, of 'Safe Cure' fame, a promoter of engaging personality and, as I found later, of fluid integrity. At our second meeting

Dr. Raymond mentioned that Emmons had made the criticism that I was not sufficiently careful in orienting my geological drawings. The Doctor bubbled over with cheery humor and pertinent information. I made the most of my privilege to discuss his editing of my contributions and to gain from him suggestions helpful in my next writing.

In the summer of 1892, while at Prescott, Arizona, I received a letter from Dr. Raymond stating that a Mr. Dunn had written to him from Australia charging me with plagiarizing his ideas on the structural geology of Bendigo; in short, Mr. Dunn claimed that my explanation of the lode-structure had been taken from him, without acknowledgment. When I read the first part of Dr. Raymond's letter I was dismayed, as might well be supposed, for this was a bolt from the blue. On reading further I found compensation; for the Doctor proceeded to say that I must not worry, the charge was refuted by the internal evidence of the text, the character of which afforded strong disproof of any such accusation. He enclosed a copy of his reply to Mr. Dunn, defending me even before he had received my denial. It was a striking proof of his confidence in my scientific sincerity, and it is worthy of record as testimony to the generosity of his mind. I wrote at once to disabuse him of the idea that Mr. Dunn was a man of no consequence, explaining that E. J. Dunn was a veteran geologist and a high scientific authority. At the same time I wrote to Mr. Dunn myself and told him that if he would withdraw his imputation I would explain how he had been misled and I would meet his criticism in a friendly way. Among the 'Errata' at the end of Volume XX of the Transactions will be found a note, by the secretary, dealing with this incident. I need not go into it further, except to add that four years later Mr. Dunn cabled to me from New Zealand, offering me an appointment as engineer to an important mining enterprise, and, when declining it, I was able to express my hearty appreciation of his good-will.

At the Chicago Exposition meeting in 1893 I had my first opportunity of watching Dr. Raymond in action, of observing how he managed the sessions and guided the discussions. His speech at the closing session of the International Science Congress, a foregathering of scientific men attracted by the Exposition, was in his best vein. The preceding speeches had been rather dull and several of the representatives of foreign countries had made the mistake of speaking bad English instead of good French or German. Hence it was a relief to listen to an accomplished speaker like Dr. Raymond. He arrested the attention of the audience at the start by saying, not 'Gentlemen', but 'Brethren'; and then, explaining that he had been called upon to respond for both mining and metallurgy, he likened himself to the camels conspicuous in the Exposition grounds, because he had to "hump himself two ways", and so gave a humorous touch that put everybody at ease. Reviewing the proceedings and summarizing the results of the international gathering, he placed his finger

on the significant feature of the conference, telling his audience that while they had brought forward new ideas and uncovered new principles, they had done even better, for they had "discovered one another".

In 1895 I was established as consulting engineer at Denver. Business was dull, so I was delighted to receive a letter from Dr. Raymond asking me to be his assistant in an examination of the Drumlummon mine, owned by the Montana Mining Company, an English corporation. He offered me a fee larger than I would have asked as a principal, and I mention the fact to illustrate another phase of his generosity. It was agreed that he should pick me up at Denver. When he arrived I arranged a luncheon in his honor at the Denver Club. The party included Thomas B. Stearns, Henry T. Rogers, Dean Hart, Dr. W. A. Jayne, Richard Pearce, and my brother Forbes. I knew that Mr. Pearce, who is now 82 and living near Liverpool, had had a falling out with the Doctor. The incident was characteristic. When Mr. Pearce was president of the Institute in 1889, he was presiding at a meeting, at Denver, to which the secretary was late in coming. The president waited for the secretary; he delayed the opening of the proceedings for ten minutes or more, expecting the Doctor to arrive at any moment, until it seemed proper to wait no longer. So the session was started with the reading of a paper, and this was hardly begun when the Doctor walked into the room carrying his dossier of papers and looking black as a thunder-cloud because the president had dared to begin the meeting without him. Unfortunately, the two distinguished gentlemen did not come to a friendly explanation on the spot, and a coolness ensued. Mr. Pearce had told me the story, with regret. It is more than likely that the Doctor had forgotten all about it, but Mr. Pearce, a gentle man, felt uneasy lest the feeling of annoyance might have survived even after many years. When our luncheon was coming to a close I decided to propose the health of our honored guest, desiring to bring him to his feet and being confident that he would make a delightful speech. As I was about to rise, Mr. Pearce, who sat on my left, said, "Mr. Rickard, will you allow me?" I said, "With pleasure". He rose and proposed Dr. Raymond's health in a charming little speech, conveying a friendly greeting, to which the Doctor responded in a similar spirit. He made a speech worthy of a bigger occasion, reviewing his early experience in Colorado and his contact with men prominent in the development of the local mining industry. Cordial relations were restored between the secretary and the ex-president, although none of the other guests understood the significance of their fraternization.

Next day the Doctor and I took train for Butte, going thence to Marysville. During the journey we played chess; for he usually carried a set of chess-men; at other times he studied chess problems or read fiction. He was fond of Anna Katherine Green and Gaboriau detective stories

and other light literature, because they afforded him mental relaxation. He talked a good deal and always interestingly, having an extraordinary fund of diversified knowledge. Among other matters I touched upon the early days of Leadville and the Chrysolite deal. The older men in the profession will recall the fact that the Doctor was mixed up in a mining scandal arising out of an over-valuation of the Chrysolite mine, nearly forty years ago. When I first went to Colorado, in 1885, that affair was quoted as a blow to the profession because it had hurt the reputation of an engineer so distinguished as Dr. Raymond. The Chrysolite was a rich silver mine and was the cause of much stock speculation on the New York mining market. An engineer whose name I forbear to mention¹—let us call him Blank—was the manager. He had been a junior when Raymond was a senior at Freiberg, and the Doctor had been a good friend to him at the Mining Academy and afterward when Blank started his career in the West. The Doctor was engaged to examine and report upon the Chrysolite. He went to Leadville. As he trusted Blank, he accepted his statements about the quantity of ore in reserve, and did not sample the mine thoroughly. One large block of ground appeared to be solid ore and its appearance was confirmed by the manager's statements; so the Doctor made a highly favorable report, which caused quotations to rise in New York. The fact was that the block of supposed ore contained a large core of limestone, as was known to the management through a cross-cut, the position of which had been hidden. When later the truth became known there was a slump in the shares and Dr. Raymond had to submit to severe criticism. Much to my surprise, when I touched upon the subject during our journey to Montana, he said nothing against Blank. Apparently he cherished none of the resentment that would have seemed natural under the circumstances. Some years afterward, in 1902, he was approached by a famous mining engineer, then engaged in the promotion of mining schemes, with a view to his writing reports, on the understanding that the sampling should be done by younger men. He asked me, at Philadelphia, what I thought about it, and I urged him not to consider the proposal for a moment. "Remember the Chrysolite", I ventured to remark. The truth is that in business matters he was too trusting and too generous to succeed, especially when dealing with persons unhampered by scruples of conscience or a sense of honor.

On arrival at Marysville we were the guests of R. T. Bayliss, the general manager for the Montana Mining Co., Ltd. Charles W. Goodale, consulting engineer to the company, was there also. The gracious hospitality of Mrs. Bayliss and the company of such men: Bayliss, Goodale, and the Doctor made the dinner at the end of the day's work a

¹ I am prompted to this reticence because I feel sure that Dr. Raymond would have wished it.

delightful social function. As the Doctor's assistant I did most of the physical examination of the mine, and when, at the end of a week, the inspection was completed, we collaborated on the report. Our duty was to make suggestions for the further exploration of the mine, which was showing signs of impoverishment, basing our advice on geologic evidence, particularly of a structural character. If I recall correctly, we made five recommendations, three of which the Doctor was kind enough to accept from me. When the report was finished, he insisted upon my signing it with him, so that it became our joint report. Again he proved his generosity, for it was a great honor to me to have my name coupled with his in a report that was to go before an important financial group in London. Our stay at Marysville was made memorable by his vivacious conversation. The evenings were spent delightfully. He proved himself adept in whist, as well as a remarkably good chess-player. Indeed, in chess he achieved distinction; for example, he was selected as one of five to play against Pillsbury in a contest at Brooklyn; he once drew a hard-fought game with Steinitz; and in 1908, when a passenger to Europe on the 'Oceanic', he led a group of players who accepted a challenge for a match by wireless telegraphy from a similar group of passengers on the 'Campania'. The team he captained won, thanks to his leadership.

In 1900 Richard P. Rothwell asked me to join him in the editorship of the 'Engineering and Mining Journal', but when I discussed the matter with Dr. Raymond he advised me against the step. When later, at the end of 1902, I went to New York to take up the editorship of the 'Journal', which had passed, on the decease of Rothwell, into the hands of James H. McGraw and then into those of the late W. J. Johnston, I received a cordial welcome from the Doctor. Just at this time, unfortunately, he had to take a holiday in Europe, to correct the bad effects of over-work, so I missed his guidance when I first took the helm of the 'Journal'. During the three or four months while he was absent I edited many of the papers that appeared in the Transactions and on his return I accepted payment in the agreeable form of a number of back volumes of the Transactions, so as to complete my set. He was still a 'special contributor' to the 'Journal' and enriched its columns with an occasional letter or signed article. In 1903 he became interested in a controversy over the New York State College of Forestry at Cornell, and took up the cudgels in behalf of his friend Bernhard E. Fernow, who was then director of the College and is now Dean of the similar college in the University of Toronto. The Governor of New York had vetoed further state aid to the College of Forestry and it was claimed by Professor Fernow's friends that he had been influenced by a group of bankers, who objected to the logging operations near Saranac lake because they interfered with their shooting. Dr. Raymond sent me a letter on the subject, for publication, with the statement that it would be followed by

six more. It seemed to me to be unsuitable for publication in the 'Journal', and, upon consulting the late Frederick Hobart, of Brooklyn, who had been a faithful assistant to Rothwell, as afterward to me and to W. R. Ingalls in turn, I learned that the controversy was of a locally political character, rendering it undesirable in our columns. It had nothing to do with mining, even indirectly. After consultation with Hobart, I wrote to the Doctor stating that I could not see my way to publishing his series of letters on the subject.¹ My declination was couched, of course, in terms most friendly and respectful, but he was so annoyed that it was a long time before he would write again for the 'Journal'. He did not like criticism or opposition—nor do any of us, for that matter. I remember his asking me if I had seen a certain article of his in 'Cassier's Magazine'. I replied, "Yes, I enjoyed it very much". Whereupon he exclaimed, "You could have had it, if you had not turned down those forestry articles of mine". I told this story one day to a mutual friend, who was quick to ask how I would like to have an article of mine 'turned down'. Then I remembered how, in 1904, I went to Dr. Raymond, as secretary of the Institute, to offer a paper discussing the recommendations of a committee of the four engineering societies on standardization of abbreviations, symbols, punctuation, etc., in technical papers. These recommendations had been printed and circulated with the current pamphlets of the Institute.² He demurred to publishing my criticisms, because he thought it inadvisable to start a discussion on the subject, the Institute—or he as secretary-editor—having no desire to impose its style on anybody. I accepted his decision cheerfully and later the rejected paper became the groundwork of my little book on technical writing, published in 1908.

During the three years of my editorship in New York I was on the council of the Institute for a time and also a member of the first board of directors when the Institute was incorporated in 1905. The council, including the president, vice-presidents, managers, treasurer, and secretary, numbered 18, but the average attendance at the meetings was only five or six. Those not present would be informed by the secretary of the decisions reached in council and would send their approval by postcard. Dr. Raymond 'ran the show'. If any of us disagreed with his plans, he overwhelmed us with reasons in support. We recognized the futility of opposition, and, it is fair to add, we appreciated his thorough grasp of the position. As my office was not far away, I was a steady attendant at the meetings, and I found them interesting, simply because Dr. Raymond never was anything else.

¹ In a recent letter to me Professor Fernow says that he is glad I did not publish the letters, "for it would have been of no use and would simply have made bad blood for him".

² They will be found in Vol. XXXV, pp. 342-346.

At one of the last meetings that I attended, in the spring of 1905, the question of placing advertisements in the Institute bulletin was broached. I objected to the proposal, whereupon the late George W. Maynard, half in fun, suggested that my interest in another publication—the 'Journal'—was at the bottom of the protest. The Doctor interjected a friendly correction, saying that there was no doubt of my loyalty to the Institute and no reason for impugning the sincerity of my motives. Nothing was decided at that meeting. Before the next one was called I went on a short visit to London and, being a member of the council of the Institution of Mining and Metallurgy, I attended a meeting at which, it so happened, this very subject of advertising was brought forward. The council of the Institution decided that it would be 'bad form' to sell the pages of its bulletin to advertisers, so the proposal was tabled promptly.¹ On my return to New York we had a meeting of the Institute council at which the subject was again brought forward by the secretary. I objected again, and was supported by the late A. A. Blow. (Again the prefix 'late'! It is saddening to realize how many of these old friends have crossed the range.) I suggested that the step was too serious to be taken by the small proportion of the council there present and that a fuller attendance was desirable before committing the Institute to such a radical departure. Dr. Raymond concurred. Soon afterward I left New York. In December of the same year, there came to me, in San Francisco, a circular stating that by "unanimous agreement" of the council, it had been decided to insert advertisements in the bulletins. I wrote to the Doctor, protesting that the decision could not have been "unanimous", because I was opposed to it, and Blow also. He replied that soon after I had left New York he had called a special meeting of the council, there had been a large attendance, he had explained at length the reasons for accepting advertisements, and he had done this so convincingly that everybody present had acquiesced, and if I had been there I also would have acquiesced! I appreciated the humor of the position and accepted it without further demur. This expression of confidence in his ability to persuade me if I had been present was characteristic—and the chances are that he would have persuaded me, by the eloquence of his argument, against my better judgment. He had a way with him!

I recall a delightful day—a Sunday, in April 1902—spent at the Doctor's home at 123 Henry street, Brooklyn. Robert M. Raymond²

¹ The council of the Institution has changed its mind since then. In April 1919 it "decided to add an advertisement section to the Bulletin" in order to increase its revenue. This departure was "undertaken with reluctance" but was considered to be "justified by the altered conditions brought about by the War".

² Who is distantly related to the Doctor's family. At the time of the Revolution their ancestors were cousins; but Robert Raymond's ancestor remained loyal to King George and moved into Canada, while the Doctor's ancestor supported George Washington. So Professor Raymond was born a Canadian and became an American by self-determination.

(now Professor of Mining in Columbia University) and I crossed the East River in time to attend the services at Plymouth Church, in company with the Doctor, Mrs. Raymond, and Miss Susan Raymond. We heard the Rev. Newell Dwight Hillis deliver a powerful sermon. After the mid-day dinner we went to the Sunday-school, which was directed by Dr. Raymond. He had been superintendent of it for 25 years and had resigned several years before, but the death of his successor had caused him to resume the duties of the position. He also conducted a bible-class, which Robert Raymond and I joined. It was immensely interesting. The Doctor's subject was the life of St. Paul. He began where he had left off the Sunday before, as if the break had been a minute, instead of a week, and poured forth a wonderful story, characterized by humor, erudition, and religious sentiment. When five o'clock arrived, the ringing of a bell called a halt, the bible-classes stopped, and the Doctor left us promptly to ascend the rostrum and conduct the closing service. The last hymn sung that afternoon was one that he had composed. Then we returned to the house and later accompanied the Doctor to the house of his aunt, a distinguished old lady, Mrs. Howard, where it was the custom for the Raymond kin to foregather at a prayer-meeting every Sunday. Then followed the informal evening meal, or 'supper', after which, I remember, the Doctor read one of Kipling's jungle stories, 'Rikki-tikki-tavi', delightfully. More good talk followed and finally he sent us back to the Brooklyn Bridge terminus in his brougham. The incidents of the day illustrate his versatility and suggest how entertaining he could be at any time or place.

More than once when I asked the Doctor to give me ten minutes of his time he would explain how busy he was and then talk for half or three-quarters of an hour. This seemed inconsistent. One day, meeting his brother, Colonel Charles W. Raymond,¹ I asked him if he had been to see the Doctor. "No", he replied, laughing, "I don't care to be used as a sounding-board". "How is that", I asked. "Well", he replied, smiling, "when I go to see him he says he is awfully busy and then keeps me for half an hour talking about some old subject in which he happens to be interested, and which does *not* interest me". I laughed with him, and recognized how I also had been ~~pleasantly~~ pleasantly hoaxed many times. When I would telephone to him asking for a few minutes for consultation, he would reply that he was terribly busy but could give me five minutes if I came right away. Upon my arrival at his office we would consume three minutes in settling the matter in hand and then I

Soon after the date of this incident, in 1904, he retired with the rank of Brigadier-General. As chairman of the Board of Engineers created by the Pennsylvania Railroad Company, he supervised the design and construction of the tunnels under the Hudson, the East River, and the borough of Manhattan, as well as the great Pennsylvania Terminal in New York.

would find myself taking a minor part in a conversation that would last for half an hour before I would remind myself of my duties elsewhere. He was simply thinking out loud on the subject that happened to be in his mind and on which he had been writing when I arrived. He had used me as "a sounding-board", as the Colonel said. That simply meant that he would be so full of his subject as to bubble over with it, if interrupted in his work by a cail. This is an excellent scheme for preventing waste of time when a visitor arrives; in most instances the visitor fails to detect the expedient and goes away under the impression that he had a good talk! As I write it, I can imagine the Doctor giving him a chuckle.

May I revert to my recollections of Dr. Raymond as editor of the Transactions of the Institute? What he did for me he did for others; therefore, I venture to record my own experience in the matter. The effect of his teaching, as conveyed by the editing of manuscript and the explanations accompanying such revision, was far-reaching. The mining profession stood much in need of such teaching and the engineers that benefited from it will ever hold the secretary in grateful remembrance. He not only revised our writings with painstaking care but he did something even more helpful: he would write long letters, in his easy flowing hand, six to ten pages, explaining why he had made certain corrections. He would give the benefit of his own wide knowledge and suggest additions or amendments of a character often vital to the value of the paper. My correspondence with him—voluminous and much valued—was destroyed in the San Francisco earthquake-fire, so I am unable to quote details illustrating his method, but I do remember his reference to "the inveterate fluent profuseness" of my style, whereupon I gave him the *tu quoque* with a smile. The only time that we disagreed over his treatment of my manuscript was when he returned one of my contributions—the paper entitled "The Cripple Creek Volcano"—without correction. The galley-proofs and the original manuscript arrived together; I was quick to notice that the latter was entirely free from marks of revision. The editor had failed to edit. I wrote a respectful letter protesting that I expected the benefit of his criticism. He wrote back something complimentary about my not needing such assistance, whereupon I told him that my chief reason for sending my writings to the Institute was to obtain the help and protection of his editing, and that if I did not receive it I would divert my contributions to technical magazines, which would pay me for them. I returned the manuscript and the galleys, making my point, thanks to his friendly concurrence.

He was a most effective speaker, because he always had something to say and knew how to say it. His memory was extraordinary. In 1904 when the Iron and Steel Institute of Great Britain held its annual

¹ In Vol. XXX, page 367, of the Transactions.

meeting in New York, he was asked to be one of the speakers at a banquet given at the Waldorf-Astoria hotel. The banquet was on a Wednesday; on the previous Monday he sent me, as editor of the 'Journal', the text of his speech, which he had written on the Saturday previous. I sent it to the composing-room and had the proof of it in my pocket when present at the banquet. If he had been unable to deliver it, everybody would have known that it was written out beforehand, because it went to the printer, as part of that week's issue (October 27, 1904) of the 'Journal', a day before it was to be delivered. While he was speaking I compared his phrasing with the proof in my hand. It was verbatim, even to interjections that seemed to be born of the impulse of the moment. For instance, he referred to King Edward, and, apparently on the spur of the moment, he interjected, "and may God bless him, as God blessed his sainted mother", a sentiment that elicited instant applause. Another similar interpolation referred to producers and consumers; he exclaimed, "Whom God hath joined together, let no man put asunder" The speech was most successful, of course; but he made a mistake, and it is one made by many less clever men. When the speech as written had been spoken, he made a fresh start, adding the equivalent of twenty or thirty lines. The chairman, Mr. Andrew Carnegie, rather discourteously, I thought, interrupted him, so that the effect of the speech was marred. Coming out of the dining-room the Doctor said to me, "How close was it to the text?" I replied, "Perfectly". He continued, "But I ought to have stopped". "Yes", said I. In preparing the memorial address, I had written that his extempore speeches could not be distinguished from those that he had "memorized". His daughter, Mrs. Bellinger, to whom I read my address before delivery, suggested that "memorized" should be replaced by "written", because when he wrote a speech he did not have to memorize it consciously: the act of writing it served to memorize it. This retentive memory was a great help to him in public speaking.

At our Institute meetings he was usually called upon to make the speech in which the visitors thanked the residents for their hospitality. This happened so often that once he demurred. It was at Aspen. Several of us in turn had been requested by the chairman of the committee on arrangements to express the thanks proper to the occasion; each in turn suggested that the Doctor ought to do it, because we knew he could do it best. When he rose to respond, he began with an apology for an apparent disinclination to perform the gracious task. He was asked to speak so often, he said, that he was reminded of the Civil War veteran who had told his little boy so much about his own performances in the War that the boy exclaimed: "Pop, couldn't you get anybody to help you put down that rebellion?" When he made a witty or humorous point, he would smile and give a little chuckle, joining in the merriment. Another story. The Doctor was called "vindictive" sometimes, by

those whom he engaged successfully in controversy. He was a skilful dialectician, and unhappy was the man whom he countered in controversy. Somebody asked Clarence King if Raymond was not vindictive. King demurred, suggesting that he was only belligerent. To illustrate the distinction he told the following story:

"Not long ago I was going up the trail from Silverton to the Silver Lake mine and I met a long train of mules carrying sacks of concentrate. Each mule had his tail tied to the halter of the one behind him, so that he was prevented from bringing his heels into action—all except the last; as I came abreast of him on the narrow trail and prepared to pass, I thought I saw a wicked look in his eye, so I said to the packer or mule-skinner, 'Is that mule vicious?' 'No', he replied, 'he ain't exactly vicious but he's kind o' versatile with his hind hoofs'. The Doctor was versatile—with his pen—undoubtedly, but he was a kindly man, a generous man, and if he used his pen so that it touched more than paper it was in the joyousness of combat and the exuberance of mind—not to hurt, but to make good his argument".

He had the ability to digest a mass of information quickly and to present it in attractive form. He could master a new subject with wonderful facility. This enabled him to give public lectures on a great variety of topics. For instance, George W. Maynard told me how one day he asked Raymond to dine with him on the following Thursday. "Thursday?" he replied, "No, I can't do it; I have to lecture on 'Storms' at the Cooper Union next Thursday". Maynard said, laughing, "What do you know about storms?" "Nothing, but I'll know all about them by Thursday". He did; he went to Washington, discussed the subject with the experts of the Weather Bureau, and returned in time to deliver a lecture that proved to his audience that he knew all about storms that was worth knowing. He accumulated knowledge as a kitten laps milk. He could correlate facts so that they became living knowledge. He was an educator.

Reminiscences

By ARTHUR S. DWIGHT

The great debt that the mining engineers of America owe to Dr. Raymond has been widely recognized and acknowledged. His untiring literary activities as writer and speaker in molding the thought, promoting the free exchange of technical ideas and experience, stimulating and aiding the naturally silent ones to speak or publish their experience, have borne rich fruit in the long line of technical volumes, which show throughout, the traces of his unerring touch; the eight volumes of the 'U. S. Mining Statistics' (1869-76), the early volumes of the 'Engineering and Mining Journal', which he edited, and the forty annual volumes of the Transactions of the American Institute of Mining Engineers. Taken in sequence, these form an almost complete history of the development of mining and metallurgy in America during the period of his professional life.

He often said that he looked upon the Transactions as his proudest and most enduring monument, but sometimes when he thought of his fellow engineers who were wrestling with the practical problems in the field, and sensing the joy of material accomplishment and success, he would remark rather wistfully that he feared he hadn't done much, after all. Such a feeling of temporary depression might be expected occasionally in a man who, to use his own words, had deliberately chosen "to give his life and strength to the vocation of an interpreter, chronicler, guide, and assistant to engineers, rather than to that of a creative and constructive leader". It is to that phase of his self-forgetful professional sympathy and generous encouragement of his brother engineers that I direct attention. Mr. Rickard in his first brief comment on Dr. Raymond's death in the January 11, 1919, issue of the 'Mining and Scientific Press', placed his finger unerringly on perhaps the truest index of Dr. Raymond's professional achievements, when he said: "He influenced the men that now influence others"

As a member of his family, it was my privilege to know personally many of his contemporaries in that brilliant group of pioneer mining engineers and metallurgists who set the standard of the profession in those early days, and who have now all passed on—Clarence King, Arnold Hague, C. A. Stetefeldt, S. F. Emmons, the Janin brothers, and others, while later I was thrown into intimate business relationship with more of the same group, Anton Eilers, my first master in the practical art of metallurgy; and Otto H. Hahn, his superintendent at Pueblo; also Franz Fohr and August Raht.

It should be remembered that up to about 1880 most of our mining

engineers were trained in the mining schools of Germany, and as late as 1885 when I went West to Mr. Eilers' smelting plant at Pueblo, Colorado, nearly all the active engineers in both mining and smelting lines were graduates of Freiberg and Clausthal. The American mining schools were only just beginning to make their presence felt, although their graduates were soon to become more numerous, and finally to exert a predominating influence on the profession.

This naturally made three groups or generations of engineers that profited by Dr. Raymond's influence, and it is well known that many careers were profoundly shaped by his ever-ready counsel and sympathetic aid.

Two captains of industry under whom it was my pleasant lot to serve, Anton Eilers and August R. Meyer, owed their favorable start in professional work to Dr. Raymond's interest and practical aid, and years afterward gladly acknowledged their debt of gratitude. Mr. Eilers became a close and life-long friend; Mr. Meyer seldom saw him again, but he retained always a lively sense of appreciation, which he expressed to me, when I came to know him well, many years after.

Two rather trivial incidents may be worth the telling, not only as characteristic of this helpful phase of Dr. Raymond's activities, but also as throwing a side light on the early experiences of these two interesting pioneers in the smelting business, who were widely known as representing the best types of technical and business success.

While a student at the Mining Academy at Freiberg, Saxony, Mr. Meyer had taken particular interest in the newly developed Parkes process for the desilverization of argentiferous lead, and had availed himself of special opportunities in the German metallurgical works to gather data for a scientific paper on the subject. On his return to his home at St. Louis, Missouri, with no very definite ideas as to what he should do to begin the practice of his profession, he wrote to Dr. Raymond, then one of the editors of the 'Engineering and Mining Journal', to enquire if the 'Journal' would purchase his article on the Parkes process, for publication. He met with a sympathetic response, some editorial suggestions as to improvements in the style of the paper, and a counter-proposal that if he did not actually need the money, he would find a larger audience and more professional credit by allowing its publication without compensation in the then forthcoming volume of Raymond's 'Mining Statistics', for which, as usual, there was a most inadequate Government appropriation. To this proposal the young man readily consented. Soon after its publication, Mr. Meyer decided to seek his fortune in the West, and naturally turned to Dr. Raymond for advice as to where he should go, and how he should get in touch with the right kind of people. He was furnished with a generous supply of letters of introduction, among others, one to Dr. Elsner of Denver, a well-known figure at that time, and in charge of

the U. S. Assay-Office at that place. On presenting this letter of introduction and explaining that he was in search of a job, he was at once asked if he was any relation to the Meyer who had written an article on the Parkes process in the last volume of Raymond's reports. He replied with due modesty that he was himself the author, and was informed that he was just the man for a job that was vacant at Fairplay, Colorado. He went there, secured the position, and soon became an important factor in the enterprise, which later led to his participation in the opening up of the rich new lead district of Leadville. It may be interesting, in passing, to mention the fact that Mr. Meyer was the man who suggested the name of Leadville at the miners' meeting called to organize the district. A great smelting enterprise developed under his genius for organization, and Mr. Meyer became one of the most recognized leaders in the industry.

Mr. Eilers came to this country in 1859, fresh from the Mining Academy of Clausthal, full of enthusiasm and hope, but with absolutely no acquaintances or connections to ensure him a chance of suitable work. After pursuing every available avenue that might lead to a position, he found himself at the end of his resources in New York; for, with superb confidence in his future, he had married soon after coming to this country.

With his characteristic good sense, he took a temporary position in a store to tide things over, and one day when he was waiting on the customers he overheard a scientific friend of the proprietor exhibiting a fine specimen of a rare mineral. Eilers sidled up to the group, managed to join the conversation, and astonished the scientific visitor by correctly calling the name of the mineral and intelligently discussing it. The visitor questioned him, learned that the bright-faced young clerk was a trained mining engineer, and promised to mention him to his friends, Adelberg & Raymond, who were then conducting a consulting business in New York and employing a number of young mining engineers on examination work of all kinds. Dr. Raymond liked the young man, who was about his own age, and after his abilities had been demonstrated, chose him as his own particular assistant, and afterward made him Deputy U. S. Commissioner of Mining Statistics. The wide acquaintance with the mineral resources of the United States that Mr. Eilers gained at this period undoubtedly had much to do with his subsequent successful career, and the literary training he acquired while working so closely with that kindly but unerring critic, Dr. Raymond, gave Mr. Eilers the command of the English language manifest in his technical writings and marking his speech.

I shall not attempt to recite in detail the steps of Mr. Eilers' progress to wealth and fame, except to say that, once he got his foot on the ladder, he climbed it himself. In his travels through the mining regions of the West, he saw the possibilities of developing the silver-lead smelting in-

dustry, to which he devoted most of his active life, and in which he was acknowledged as the dean. He it was, more than any other, who substituted scientific principles for rule-of-thumb methods, and pointed out the way for the evolution of the modern American practice of lead smelting.

He never forgot how he had been helped in his early struggles, and he passed on the benefit to others. His plants were not sweat-shops, but training schools. He selected his staff on the principle that the humblest assayer's assistant was in line for promotion to manager, and some of us were so fortunate as to put it to the test. Thus, Robert Sticht, Walter H. Aldridge, Robert M. Raymond, Karl Eilers, Paul Bellinger, Frank M. Smith, Phil A. Mosman, Howard F. Wierum, and others in lesser degree, were the beneficiaries from this continuous chain of helpful influence, which started with Dr. Raymond, although all of us enjoyed also the direct benefit of Dr. Raymond's personal interest and friendship.

In my own case, the debt is too great to calculate. It runs back into the vague shadows of my earliest recollections, with some of the romance of his early experiences as soldier, traveler, and miner in the golden days of the West reflected in these childish memories. It was his wit that always set the pace in the merrymaking, and the lessons in honor and duty were part of the introduction to the beautiful and joyous things of the world. The last word I had from him was characteristic of this happy mixing of fun and deep feeling. I was in France when the news of his death reached me, only a few weeks after the Armistice, and the joyous prospect of soon returning home was dimmed by the thought that he would not be there with his usual welcome. A fortnight later there came a belated letter from over the sea, bringing me this last message of benediction:

"We are long behind in news from you. I wonder when you have all been paralyzed by Victory, same as us? We dassn't say a word, for fear by the time it get there, it won't be so, nor anything like, but quite damnably otherwise!

"And now the boys are going to return after a while and after a fashion! What, Oh, what a time we shall have, piece by piece, in welcoming them, in vulgar fractions, as they come dribbling home!

"I fear you engineers will have to stay behind for a while and clean up—the rear guard of the grand army that swept from the coast to the Rhine, but did not sweep perfectly clean, and now has to be followed up with *salvage barbarity!*

"This is a wide and deep Thanksgiving joy that we are having today, and we feel the presence of our beloved *all*—those who are physically absent, in *any* 'over there'. God bless them and us, all gathered together under his One Blessing!"

Reminiscences

By C. W. GOODALE

My acquaintance with Dr. Raymond began in 1876, when I was elected a member of the Institute, and attended the Philadelphia meeting, and the excursions to the coal mines and steel works of Pennsylvania.

The Institute received a large addition to its membership in that year of the 'Centennial', 214 new names having been added to its list, making a total of 613.

Some of Dr. Raymond's characteristics impressed me at that time: his cordiality and helpfulness to new members. This friendly spirit was an important factor in the growth of the Institute in its early years. The members who attended excursions of the Institute had opportunities to become well acquainted with the Doctor in a more personal way.

In the litigation connected with the Drumlummon mine at Marysville, Montana, which began in 1889 and ended in 1909, it was my good fortune to be associated with Dr. Raymond as a witness for the Montana Mining Co., and during one of the trials in 1893, which required several weeks, the Doctor occupied his leisure hours in translating Posepny's paper on 'Ore Deposits'. In this, as well as in other incidents of his busy life, he confirmed the statement, "So true it is, that it is not time that is wanted by men, but resolution to turn it to the best advantage".

After the first important trial in the above-mentioned litigation between the Montana Mining Co., Ltd., and the St. Louis Mining & Milling Co., a suggestion was made by the management of the former company to the latter, that a conference between engineers selected by both sides might result in a compromise. Acting on this idea, the Montana company named Dr. Raymond, who was much pleased when he learned that Prof. William B. Potter, a former president of the Institute, had been selected to represent the St. Louis company.

Dr. Raymond arrived at Marysville in April 1894, and a few days later he learned indirectly that Prof. Potter was in town. Believing that Prof. Potter would want to look into the question first under the guidance of the St. Louis management, Dr. Raymond awaited notice from him that he was ready to take up the question. But no such notice was received, and it was soon known that Prof. Potter had left the town. In reply to a letter from Dr. Raymond, Prof. Potter stated that as Dr. Raymond had arrived first, it was up to him to make the first call, to which Dr. Raymond replied that he "was not aware that any 5 o'clock tea etiquette prevailed in the Montana mining camps".

Thus an effort to bring about a settlement of the controversy failed, and 15 years more of litigation followed, with great costs and much annoyance to both sides.

In the following incident we see Dr. Raymond's contempt for a bad political appointment. In July 1887, the Institute had meetings at Salt Lake and Butte, and one of the pleasant incidents in the latter city was a delightful luncheon tendered by the Blue Bird Mining Co. on one of its lower levels. A few weeks before, on the 13th of June, the Butte Miners' Union had marched in a body to the Blue Bird mine, where the Union had not been recognized, and demanded the privilege of sending men through the mine, for the purpose of 'rounding up' the miners, with the avowed intention of compelling them to march back to town and to join the Union. The superintendent refused, whereupon the Union threatened him, and, among other pleasantries, threw a rope over his head. Failing to get any protection from the sheriff's office, the management had to give way and the miners carried out their plan. The leader of the party, W. J. Penrose, who was also the orator of the day, justified the action of the miners in his speech, and in allusion to the rope, he said: "Nobody saw the rope thrown, but it got there just the same".

The closing event of the Institute meeting in Butte was a banquet given by the citizens, and Penrose was a guest; later on, appearing at the Club, where he again took great glory for the miners over the Blue Bird outrage. Institute members who were present, among them Mr. E. G. Spilsbury, resented this glorification of an indignity suffered by one of the hosts of the party, who was also an honored member of the organization. When Dr. Raymond heard of it, he made inquiries about Penrose, and the following facts came out: The Territorial legislature, a few years before, had passed a law, creating a Labor Arbitration Board, to be appointed by the Governor, one member from the employing class, one from the ranks of labor, and the third was to be impartial and disinterested. The Governor had appointed Penrose as the third member of this Board, and the wisdom of the selection may be judged from the following quotations from Penrose's own paper, the 'Butte Mining Journal', in referring to the Blue Bird incident:

"The party then proceeded to the engine-house of the hoisting-works, and as they reached a trestle that is at the approach, some one in the rear noticed a piece of rope, about three or four feet long, lying near the trestle. In a spirit of mischief it was taken up, tied into a noose and carelessly thrown into the air, and alighted, surely by accident, upon the head and shoulders of the superintendent."

Editorially, Mr. Penrose said:

"Taken in connection with all the facts which preceded and formed a part of the events of the day, we cannot but justify the action of the Union, and we firmly believe the future will vindicate it."

The Doctor contributed to the 'Engineering and Mining Journal' some editorial correspondence on the manifest unfitness of Penrose as an impartial arbitrator, and, among other caustic remarks, said:

"And when some funny fellow, who advocates such performances, is appointed to an important office by the Governor, why shouldn't all truly good-natured people smilingly ask the Governor what in the name of Opera Bouffe he means by it?"

Of course, Penrose replied, and, in closing, evidently thought he had clinched the argument by saying: "Mr. Raymond can go to —;" to which the Doctor replied:

"The elegant editorial in the 'Butte Mining Journal' concludes with the declaration that 'Mr. Raymond can go to —.' This appears to be a kind of free pass, issued by an agent of the line. As Mr. Raymond has no use for it, Mr. Penrose had better keep it. The time may come when he will be glad of a blank ticket to —, anywhere out of Butte, although for the present he does not need such aid, since, in his great character of Impartial Third Member, he is entitled to travel at the public expense."

He also made use of the following scorching words:

"This is the 'episode' which was 'long ago settled', when I visited Butte, a month later. I should be glad to know how it was settled. Were the actors in the outrage expelled from the Miners' Union, or otherwise disciplined? Was the 'election' of prisoners under duress declared invalid? Was Mr. Penrose in jail, or on bail? On the contrary, so far as I could learn, nothing whatever had been done; except that the blatant demagogue who had insulted public decency, imperiled public safety, and defied public justice with his incendiary ribaldry, had been selected by the Governor as satisfying the words of the statute:

"'And the third shall be a citizen who will not probably be directly interested in any dispute between employers and employees'

"Mr. Penrose may think, or profess in his nose-paper to think, that this preposterous appointment 'settled' all 'episodes' of his previous career. To me, it appeared that the affair had 'settled' like any other nasty precipitate, to rise again on the first agitation of the waters. The fact is, mere 'settling' won't do for Penrose. He ought to be filtered out and thrown away."

Reminiscences

BY ROBERT W. HUNT

It is my privilege to have known Dr. Raymond for many years, and our acquaintance (and I may claim friendship) began and continued in connection with the American Institute of Mining Engineers. There was a brilliant coterie of men identified with the formation and the early days of the Institute's history. They were men of social as well as of scientific tastes, and were naturally drawn together; their intercourse sparkled with wit and humor in the midst of the more serious consideration of the subjects that interested them. Those who were fortunate enough to enjoy the friendship of Sterry Hunt, Persifor Prazier, Eckley B. Coxe, Thomas Drown, Alexander Holley, J. F. Holloway, and others of that day, with Dr. Raymond always one of the most brilliant, were to be congratulated upon their good fortune, and to those of us who still live, the memory of that intercourse is among our most cherished recollections. They were great men all, but none greater than Dr. Raymond. He was the personification of culture, of retinement, and application. Few men have possessed so great and detailed knowledge of so many subjects, and yet fewer who had all of that knowledge at their immediate command.

As an illustration of Dr. Raymond's wonderful ability to present technical subjects to the non-technical mind, in not only a clear but also an attractive manner, I recall the meeting of the Institute at Troy, New York, in October 1883. I was the president; Troy was my home, and naturally I was anxious that the meeting should be a professional success, but also that the Troyans should form a good opinion of an Institute meeting. It must be remembered that the Institute was but 12 years old, and had not then taken the commanding position among technical societies that it so soon attained. Communities among whom Institute meetings were held did not always distinguish between the various kinds of engineers, and sometimes, as at Baltimore, expressed the hope that the visiting mining engineers would not inaugurate another strike. At all events, the committee of arrangements and I were anxious that the Troy meeting should start in not only a dignified, but also an attractive, manner. At that time, Martin I. Townsend was one of Troy's most distinguished citizens and a pleasing orator. He was selected to make the welcoming address at the first meeting, and, to follow the president's reply, we felt that we ought to have a presentation of some scientific subject in a popular and attractive manner. Dr. Raymond suggested that he would give a brief talk upon 'The Law of the Apex'. I admit that I felt skeptical, but I had all confidence in Dr. Raymond, and it

was so arranged. He gave one of the most delightfully instructive addresses to which I have ever listened, and, needless to say, captured his audience. With that auspicious start, the Troy meeting was a highly successful one. Later Dr. Raymond elaborated his speech into a carefully prepared paper which is in the Transactions as having been presented at the Troy

In July 1905 it was a fortune to be with the members of the Institute, Dr. Raymond, Secretary, on their visit to Alaska and the Klondike, where we were the guests of the Dominion government. In July 1906, the Institute went to England and Scotland as the guests of the Iron and Steel Institute; this lasting two weeks, beginning with a joint meeting with our hosts in London. After a week's rest, there followed a trip across the Channel to Düsseldorf, as the guests of the Association of German Iron & Steel Manufacturers. In October 1911, the Institute accepted an invitation from its Japanese members to visit that country; and we who went found ourselves practically the guests of the Japanese government. All four of those trips were most successful, and as it happened that I was at these times either the president of the Institute, or delegated by the council to act as such, I was thrown into closer relations with Dr. Raymond during the visits than would have happened otherwise.

Dr. Raymond not only commanded the respect of our hosts, but also won their esteem. He never made an address that did not present matter for thought and displayed so intimate a knowledge of his subjects, and the national or local conditions bearing upon them, that thereby greater weight was given to his suggestions and conclusions. The Mikado decorated him, and some of his Japanese friends and admirers presented him with a valuable piece of silver, illustrating Japanese art and skill.

Those who have only known the Institute during these later years can form but an imperfect idea of the struggles and labors incident to its earlier life. While it has been successful from the day of its organization, it has been so only through the unselfish devotion of those who founded it and their younger associates and successors. In my judgment, the Institute has accomplished a greater work in bringing into harmonious, and therefore mutually helpful relations, the mining and metallurgical interests of America than any other organization. It was the first to secure the hospitably open door to mine, mill, shop, and factory.

For nearly 50 years the Institute was a large part of Dr. Raymond's very life. He gave to it the best of his best, and from so doing, it became the harder for him to transfer some of the burden to others, but the American Institute of Mining Engineers (no matter what may be its future name) will always be Rossiter Worthington Raymond's greatest monument.

Reminiscences

By HENRY M. HOWE

Rossiter Worthington Raymond was extraordinarily brilliant, witty, eloquent, and versatile. With him you at once felt yourself in the presence of an uncommon and most interesting intellect. His versatility would have made him shine in any calling.

In starting to write of him, the memory of the first time I saw him, at the second meeting of the Institute in the autumn of 1871, comes back as fresh and clear as yesterday.

He and Egleston were the striking figures of that gathering, each acting as a foil to the other. Egleston's splendid and uplifting enthusiasm, his burning devotion to his mission which he thirsted with all his soul to fulfill, only made clearer the ponderousness of his thought and speech, against which he struggled as a burden of the flesh. He forged his thoughts on an anvil which ever rang true, but with a hammer so unwieldy as to enhance the effect of Raymond's brilliant epigrams, his masterly short cuts of reasoning, his silvery eloquence, his striking intuitions, and most of all his extraordinary mastery over language. It was this that gave him his eloquence, his charming style, his wit, and his controversial powers. Perhaps he never shone more brilliantly than when, moved by sheer joy in the intellectual feat, he would defend a position so difficult that he hardly would have adopted it on sober second thought. Here he showed himself the master of every device of eloquence and rhetoric, including sophistries so adroit and so skilful as to raise our admiration or our exasperation according to our point of view. One of those closest and dearest to him is said to have exclaimed in despair, "The more you say so, Ros, the more it isn't so".

But these were only the delightful pranks of his exuberant intellect. his intellectual romps, for, in fact, he was essentially most serious and dutiful with a nature profoundly religious, and a heart yearning for service to God and Man.

Shining as he did as an intellectual leader of our guild, he often seemed to have strayed into it by accident, to have passed by the claims of the ministry and the law, in which his gifts might perhaps have brought him even greater distinction. His religious activity at Plymouth Church was on the same high plane with his professional work, in which indeed he excelled as a persuader and exhorter.

So, too, his devotion as husband, father, and brother knew no bounds. Greatly as he delighted in things intellectual, he was moved even more

by sympathy, affection, and sentiment, a man rather of the heart than of the head.

Looking back on this rare figure, who played so brilliant a part in our work, this leader, preacher, writer, orator, stimulator, wit, controversialist, biographer, and lover, each of us may well say:

"Take him for all in all,
I shall not look upon his like again."

A Tribute

BY ALFRED R. BELLINGER

¹ I have no desire to attempt any complete picture of my grandfather; I want only to tell you of the way he appealed to a young man. My chief feeling about him is that he was the most interesting man I ever knew. He could talk, and talk well, on an endless variety of subjects. His own experiences furnished an inexhaustible mine of anecdote and illustration. He was forever producing some tale of his younger days quite new even to those who knew him best. And beyond his own experience there was no limit to the subjects which engaged his attention. When I came back to Brooklyn from school or college, one of the great things to look forward to was, what would be Grandfather's new interest this time. It might be the Greek philosophers or the distribution of animals, the book of Amos or the letters of Cicero; it was sure to be something unexpected and something which he could make fascinating even though I knew nothing about it. After I had gone to the little hall-bedroom, he would come in with a book and we would talk into the small hours or until some more virtuous member of the family put an end to the discussion. It was always rather discouraging to me that, after such a night, Grandfather would be up at dawn, as fresh as ever, while I was fain to sleep through breakfast.

I liked to bring my friends to meet him, for his interest in people was as great as his interest in science or law or philosophy. His greatest virtue as a companion of young men was that he never condescended; it never appeared to occur to him that we were not his equals. If he happened to disagree, it was as he would with a man of his own age and never with any assumption that he must be right and we wrong because he was our senior. Those who appreciated him most did not always agree with him by any means, but the disagreement never stood between them, for no one could be more tolerant of an honest difference of opinion with his friends, however overpowering he might be in arguing the point.

He never preached to us or worried over the sins of the younger generation. I doubt if he was much interested in sin; at least he was far too wise to try to repress when he could inspire.

I have many memories of my grandfather: filling the pulpit here or at Washington; drowsing over the chess-board, long ago, while I laboriously learned to mate with a king and queen; expounding some point of science among mining engineers; tyrannising over the conversation at the dinner-table. But my best and strongest memory of him will always be as the supreme interpreter to a younger generation of the richness of life.

¹ Delivered at a meeting in memory of R. W. Raymond and two other Plymouth men held in Plymouth lecture-room on May 9, 1919.

JAMES AND JIM: TWO BOYS

A STORY OF THE COAL MINES

BY ROSSITER W. RAYMOND

CHAPTER I

MR. MARK MORLEY was the superintendent of two institutions, the Ebony coal mine, and the Sunday-school attended by the children of the miners.

In his capacity as Sunday-school superintendent, Mr. Morley took much interest in a bright young fellow, who paid such close attention to everything that was said by his teacher, as to be quite an exception to the average Sunday-school scholars. One day he stopped by the class to which this boy belonged, and talked with him awhile. When praised for his attentiveness the boy laughed and said, "Well, you see, sir, I have to learn it all here; and most of the others, they can learn afore they come".

"Can you read?" asked the superintendent: "haven't you got a book?"

"Oh, yes, sir! I can read", replied the boy; "and I've got a book, but it ain't the right kind."

Some time interrupted the conversation here—something is always interrupting a Sunday-school superintendent, you know—but the boy's words kept ringing in Mr. Morley's mind; and when Christmas came, not long afterward, and he had the pleasure of giving a prize for constant attendance and good behavior to this very boy, he handed him a Testament, with the remark, "This is a book of the right kind, for a boy of the right kind". Moreover he made up his mind to inquire further about that boy, and watch his progress carefully; but he never got beyond finding out that the boy was an orphan, whose father had been killed by fall of rock in the mine. His name was James, and he seemed to be about fifteen years old.

Soon after this, Mr. Morley became interested in another boy of about the same age, whom he found in a very different place. He also was an orphan; and if his name was not James, it came pretty near, for it was Jim. But before I tell you about Jim, I must give you some notion of the place where Mr. Morley found him. Sunday-school, I trust, is so familiar to you all, that you do not need a particular account of that; but a coal mine may be a very different case—though, indeed, the first Sunday-schools were held in places not unlike mines; namely, in

the dark catacombs of Rome. However, unless you understand something about the coal mines, you will scarcely be able to follow my story. So here is a lecture on the subject, made as short as possible. You know a telescope has to be drawn out a little if one is to see anything through it; and all you can ask of a story or spyglass is, that, when the right focus has been reached, the drawing-out shall stop.

Coal is found in beds, or seams, which lie in the rocks as a slice of ham lies in a sandwich. Sometimes these beds are nearly horizontal; sometimes they are tipped up. Now, there are three ways of getting the ham that is in a sandwich. One is, to eat the whole sandwich, ham and all; which is what most sensible and hungry people do. The second is, to take off the top-piece of bread, and so expose the ham. This children sometimes do when they are not very hungry, and want to amuse themselves. The third is, to dig out the ham without disturbing the bread. And this third way, which nobody ever thinks of taking with a ham-sandwich, is the only way that can be practised with those great sandwiches in the rocks, the coal-beds. We have to take out the coal, with the use of picks and drills and hammers and gunpowder, and let the rock alone as far as possible. So you see, although the edge of the coal may show at the surface of the ground, just as the edge of the ham shows in the sandwich, yet, before we have proceeded far with our digging in it, we are altogether under ground, and the hole we have made is a mine.

Now, there are four things to be attended to in coal mining. First, there must be a safe way kept open by which the men can go in and come out, and the coal can be brought to the surface after it is broken from its bed. Secondly, something must be done to keep the rock overhead from falling on the coal, after it has been broken, and crushing and burying it, (what is more important) from falling on the men, and crushing and burying them. Thirdly, the water that collects in the mine must be got out of it, or it will gradually fill up. Fourthly, the mine must be ventilated, that is, supplied with good fresh air. This is more important in coal mines than anywhere else in the world; although it is important everywhere, —even in Sunday-schools. I sometimes think that if all Sunday-school superintendents were also, like Mr. Morley, managers of coal mines, they would care more about ventilation; and I am sure they would know better how to go to work and get it. For there is nothing that makes people learn and remember like a great danger. If you knew that unless you had your lesson perfectly you might be suddenly struck dead, you would study hard, and make no mistakes. You wouldn't get up a little headache, or forget where the lesson was, or lose your book, would you? Well, that is the way they study and practise ventilation in coal mines. One blunder, one act of carelessness even, has often cost hundreds of lives. So you may well imagine that they try to get their lesson well;

and I think they could teach some things to the very ingenious gentlemen who build dwellings and churches.

But I must go back a little just to hint to you how the other necessary things I have named are secured. For getting in and out of the mine we sometimes use long tunnels, beginning in valleys, and running into the hills. But often it is necessary to make pits, or 'shafts' as they are called, like great deep wells, going down at an angle into the ground with the coal, or straight down till they reach it. Then at different levels horizontal halls, called gangways, are cut out in the coal; and from these halls the workmen dig chambers, or 'breasts' as they are called, bringing the coal into the halls, loading it in cars, and carrying it to the tunnel, where it is trundled out, or to the shaft, where it is hoisted out, to daylight, or, as the Cornish miners say, 'to grass'. 'Go to grass' is an expression which we sometimes hear boys use, when they mean to be very contemptuous; but if, after being for hours in the darkness and dirt of a coal mine, you had ever come out at last to see once more the sunshine and blue sky, and the green earth, you would think 'going to grass' a thing not to be despised.

If you imagine a big hotel, with a hall in the middle, having a long winding staircase and an elevator, and then on every story halls going away on either side, and bedrooms opening out of these, you will get some notion of the shaft, gangways, and breasts of a mine. Only in the Ebony coal mine, to which my story refers, the central hall, or shaft, was inclined; and consequently the bedrooms, or breasts, were tilted like state-rooms on an ocean-steamer in a storm. This was all the better; for, when the men loosened the coal up in the breasts, it rolled right down to the gangway of its own accord. In all the gangways there were railroads, and the cars full of coal were drawn by mules to the main shaft. Here they were hoisted by means of a long steel-wire rope, wound up by a mighty steam-engine which was stationed in the shaft-house at the top. The mules lived down in the mine. They had a stable there, and seemed perfectly contented, though they saw no other light than the smoky miners' lamps. Really they were quite comfortable.—no changes of weather, no changes of work; only one serious annoyance, namely, the rats, which would get into their mangers after the corn, and, not satisfied with stealing a part of their food, would bite their noses, to prevent them from eating altogether. But mules can bite, as well as rats; and, although the war went on, both parties seemed to thrive. Nothing suffered seriously but the corn.

The shaft, the gangways, and to some extent the breasts or chambers, were protected against the falling in of the rock by stout timbers. The water was raised from the lower levels by means of great pumps, operated by the steam engine on the surface. But when it had been raised half-way, it was delivered into an o'd tunnel that went out about a quarter of

a mile into a valley. Before the mine became so deep that a shaft was necessary, this old tunnel was the main entry to it; now it was used for nothing except to carry away water.

I must tell you a little more about the ventilation, and then the lecture will be done, and the story will begin again in earnest.

As I said before, coal mines need to be more thoroughly ventilated than any other places which men have to enter. The reason is, that besides the burning and smoking lamps, and the breathing and sweating of men and animals, which make the air unfit to breathe, the coal itself produces very dangerous gases. The principal ones are the 'black-damp' and the 'fire-damp'.

Black-damp is what the philosophers call carbonic acid. It is the gas which bubbles up in soda-water; but, while it is very good to drink in that form, it is not good to breathe. A little too much of it in the air gives people the headache; and a good deal too much kills them. Lights will not burn in it.

Fire-damp, on the other hand, is somewhat (though not exactly) like the gas we burn in our houses. It takes fire easily; and when enough of it gets mixed with ordinary air, it may explode, or 'blow up', just as our common house-gas sometimes does when a gas-burner has been left open until the room is full of it. After burning, or exploding, the fire-damp leaves behind another gas, called the 'choke-damp', which is almost as bad. It will not burn, but it stifles people like the black-damp.

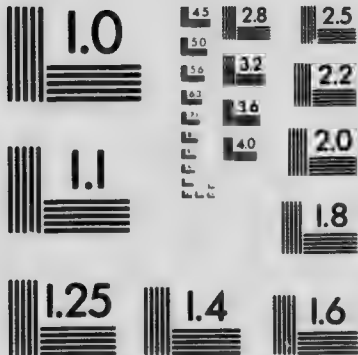
One thing is very fortunate for the miner—fire-damp and choke-damp are lighter than common air; and so they float along the top of the gangway, over his head, while black-damp is heavier than common air, and lies along the bottom. So that, if there is not too much of them, and they are not stirred up and mixed together, there may still be a layer of air fit to breathe in the middle of the gangway, though the gases at the top and bottom are poisonous. How would you like to crawl along a dark hall, knowing that if you carried your head too high or too low you might faint away, and never 'come to' again?

But you must not think that this is the ordinary state of things with the miner. On the contrary, a vast current of fresh air is constantly forced through the mine by engines and blowers, to sweep it clear of all these noxious gases. It is only when by some accident to the machinery this current is stopped, or when by some sudden fall of coal or rock a quantity of the gas, imprisoned in the coal, much greater than can be immediately cleared away, rushes into the mine, that such terrible fires, explosions, etc., as we read about become possible in any well-regulated mine, like the Ebony. And you may be sure there was great care taken by Mr. Morley. The pure air was drawn through the mine in a perfect breeze, by a huge revolving fan run by steam at the top; and so well was everything arranged, that although in former times the Ebony had



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had the reputation of being a very 'fiery' mine, and many men had been badly singed or even killed by the little and great fires and explosions that had taken place there, yet for several years before the time of our story there had not been a single accident of that or any other kind. There was not even a safety-lamp, except the one which Mr. Morley or his foreman carried when they went exploring into some parts of the old workings where the fresh air could not so freely pass. A safety-lamp is a sort of lantern, so constructed that it will not immediately set fire, as a naked candle would do, to the fire-damp around it. But it gives a dim, dingy light, and the men don't like to use it; and they are only too likely, when they fancy there is no danger, to open the lantern, and get the light out, so as to see better. Mr. Morley used to say he would rather pour so much fresh air through the mine, that safety-lamps would not be necessary, than risk some great disaster from such carelessness in their use.

One thing more, which brings us around very gracefully to our story. With all the apparatus and all the pains taken to make a current of good air, it was not always possible, without special aid, to ventilate the breasts. These I have compared to bedrooms. Now, you know a bedroom, with the window shut tight, and only a hole over the door, will not be well ventilated. Some people appear not to know that, but I trust you are better informed. In the Ebony mine they connected their chambers, or breasts, as fast as they could by a sort of back entry as an air-passage; but while they were excavating or digging out a new breast, and before they had any rear connection for it, the air needed by the men had to be blown in to them. This was done by means of small revolving fans, looking somewhat like a patent churn, with a boy to turn the crank. As long as the men were at work in the breast, the boy turned that crank, and the fresh air was forced up to them from the gangway through a tin pipe. They were out of sight; but they would soon know if the fan stopped, by the dim way in which their candles would burn, and by the feeling which the bad air would give them.

One day Mr. Morley was passing along a gangway opposite a new breast. Even before he had reached the spot he had heard the whirring of the fan. But when he got near enough to see clearly he stopped short, gazed for a moment in wonder, and burst out laughing. The boy whose business it was to keep the fan going had contrived a very comical way of doing it. He had placed a piece of board so that he could lie on it, taking care to have the end for his head considerably higher than the other. At the lower end of this board stood the circular box containing the fan, and the crank-handle projected over the board. This arrangement being complete, the young inventor had tied one of his feet to the crank-handle and then laid himself flat on his back on the board, in which position he was turning the crank luxuriously with his foot. His hat was perched on

the front part of his head, as ladies' hats are sometimes worn. In the front of this hat was hooked, according to miners' fashion, his little tin lamp; and by its flickering light he was reading a dime-novel. The board, the boy, and the book were all black with coal-dust. In fact, nothing white could be seen except the corners of the boy's eyes and two rows of teeth, which he showed when he heard the superintendent laugh.

"Hallo!" said Mr. Morley, "who are you?"

"Jim," replied the boy, laying down his book, and putting his hands under his head, and never stopping for an instant the steady motion of his foot and leg. He paid no attention to that part of his body; and it seemed to go of itself, as if it were a machine with which he had nothing to do.

"That leg of yours will get bigger than the other", said the superintendent, "if you give it so much exercise."

"Change 'em once an hour," replied Jim. "D'ye think I'm a fool?"

Mr. Morley laughed again. Then he said more gravely, "I don't know about this, my boy; it looks a little lazy. I'm afraid you forget the fan sometimes. That won't do, you know".

"Contract", answered Jim promptly. "My boss is up in the breast there; ask him." And his manner said, plainly enough, "If he is satisfied, it's none of your business". Mr. Morley took no offense where none was meant. It was quite true, as Jim said, that the head miner in the breast paid all his own assistants, and was paid himself by the company according to the amount of coal they got out. And, moreover, the miners, when afterward questioned, declared that Jim gave them more air and steadier than any boy they had ever hired.

The superintendent determined to make friends with this grimy, smart boy; so he continued the conversation, saying first, "You are right there; if the men get air enough, I don't care whether they get it by leg-power or hand-power". Then he added quickly, "How do you like your story?"

"The head of it's gone, and the tail of it's gone", replied Jim, "and I can't make nothin' out of the middle."

"What makes you read it, then?"

"Why, a fellow must read something, mustn't he?" Mr. Morley stood a moment, wondering what kind of book, not too dry, and yet not trashy and worthless, would be suitable for such a case. Presently he said, "What do you do when you are not reading?"

"Rats!" was the unexpected reply. "Want to see 'em? Well, I expect you can't. They don't come out for company. But they'll come out fast enough when I whistle for 'em, if I'm alone. There's old Abraham Lincoln behind you now."

Mr. Morley turned quickly, but Abraham Lincoln had vanished. "Do you know all the rats?" he asked in surprise.

"Sixteen", said Jim. "Won't have any more. The 'sociation's full. Not vittles enough to go round. When any of the rest come smell-

ing about, I hit 'em on the nose, and make 'em go away. Say, do you think sixteen rats, if I shut 'em inside, like a squirrel in a cage you know, could run that fan?"

The superintendent fairly roared at this idea. "Well, well!" he exclaimed; "you'll be an engineer some day, if you keep on. That's the first use I ever heard suggested for rats in a mine."

"Oh, they're good for more'n that!" said Jim, sitting upright in his animation, but still churning away vigorously with his machine-leg. "Perhaps they couldn't turn the crank, but they know a heap of things. You ought to see Abraham Lincoln climb a post when he's afraid of the black-damp. You see, he's so little, that if he staid down in the gangway the black-damp would drown him, sure. So he climbs a post. Tell you another thing. Them rats go out of the mine whenever they're o' mind to, and they don't go up the shaft, neither. I tried to make Abraham Lincoln tell me the way,—tied a string to his tail, and let him run, and followed him. No use; he just ran under a cross-tie, and there he staid till I was tired out waiting. But I'll get it out of him!"

"Probably the rats use some of the old passages and air-ways", said Mr. Morley carelessly. "You know they can go through places where the ground is so caved and crushed that a man couldn't pass." But Jim shook his head. "Abraham Lincoln won't go where it ain't safe for a man", said he positively. "He's too smart. But I'll have it out of him!"

"I must be getting along now", said Mr. Morley. "I am sorry I can't stay longer."

"So be I", replied Jim, "it eases my leg."

"Wouldn't you like to have me bring you a book to read next time I come—a book that will tell you all about the machinery of the mine, and the black-damp and fire-damp and after-damp, and perhaps about the mine-rats too? Though I think you know more about them now than any book can tell you".

Jim's eyes shone out of his grimy face like lights in a very dark gangway. "Is there books like that?" he said under his breath. Then, looking ruefully at his dirty hands and clothes, he added, "Spile it".

"But I will give it to you; and you may spoil it and welcome, if you will only read it. Good-by". And the superintendent, much interested and amused by his new acquaintance, strode off along the gangway. Jim looked after him until his light was lost in the distance; then he picked up the fragmentary dime-novel, and tore it into small pieces. "I'll be an engineer some day", he muttered, "that's the very word he said. He was making fun, but I ain't!" And with that he lay back on his board again, keeping up all the time the ceaseless revolutions of the fan, and whistled for his rats. Abraham Lincoln was the first to appear. "Old fellow", said Jim, "whatever you know, you've got to tell me. Just make up your mind to that!"

CHAPTER II

MR. MORLEY had a number of copies of just such a book as he had described to Jim—a simple and interesting account of the operations of mining, made expressly for common miners to read, so that they might be better prepared to deal with the difficulties and dangers of the business. The very next day he put one in his pocket, and was fully repaid for his gift when he handed it to the boy, and saw the eager delight with which it was received. "I think that is the right kind of book for the right kind of boy", said he kindly; and as he said it he remembered that he had recently used the same words in presenting the prize Testament to that other boy, the bright James of the Sunday-school. Jim reminded him somehow of James too; though his manner was different, and his looks—well, there is no such thing as looks in a coal mine. Folks all look alike there, they are so dirty. But Mr. Morley took occasion to say, "I wish you would come to our Sunday-school, Jim; you would find it very pleasant there. I gave a Testament only last Sunday to a boy of your size, as a reward for his good behavior. Perhaps you might earn a Testament too. Don't you think you could come?"

Jim may have blushed, or looked embarrassed; nobody could have told, you know, on account of the coal-dirt on his face. At all events, he hesitated a moment, and then replied, "I don't need no Testament". The superintendent was too wise to tease him, preferring rather to gain his confidence, and trusting that he would then be able to influence him. Now his only reply was, "Nobody in the world can say that, Jim". Then he dropped the subject, and they had another long and queer talk, in which Mr. Morley thought he gained quite as much information as he was able to give. For Jim was so wonderfully observant, that, although he was ignorant of many things which most people know, he had found out a great many things with which almost nobody else was acquainted; and, when he got a-going, he kept up his end of the conversation uncommonly well.

Not only that day, but many times after that, Mr. Morley stopped to chat with Jim, and was amazed at the way the boy learned and remembered all that was told him. The little book about mining he knew before long by heart; and his shrewd questions and arguments about it showed that he had turned over and over in his mind every word of it. "You see", said he, "I say it to the fan, keeping time with my leg, this way: '*Black-damp is heavier than common air; fire-damp and choke-damp are lighter: hence if you want to get good air, look in the middle of the gangway!*'" The way he chanted this passage, emphasiz-

ing the syllables that marked the time, was very ludicrous. "Then", he added, "I talk it over with Abraham Lincoln!"

So matters went on until Christmas came again. All through the year Jim had defeated every attempt to get him to Sunday-school. But the day before Christmas, Mr. Morley said, "Now, Jim, you and I are such good friends that we ought to exchange presents. My gift to you is that I am going to promote you to better work and better pay, and a chance to learn something about mine-engineering. And your gift to me must be this: when the Sunday-school children come to my house tomorrow, you must come too. There's no work in the mine, you know."

Jim was so overcome with the promise of promotion, that he could scarcely speak; but at last he managed to say that he would come; and the superintendent departed in high delight, to think that he had at last conquered the strange reluctance of the boy. "I wonder what he will look like", he thought, "with his face washed!"

But, alas! Mr. Morley was doomed to disappointment. In all the merry company that gathered at his house on Christmas Day, he saw no Jim. James was there; oh, yes, of course! The superintendent was almost angry with James for being such a good boy, and coming so regularly, while that queer, eager, ambitious, interesting, dirty Jim could not be persuaded to come even once. Then he reproved himself for such injustice, and remembered that, although he had smiled on James, and shaken hands with him occasionally, he had never taken the pains he once meant to take to really get acquainted with him. Jim had proved so very fascinating that he had rather lost sight of James, particularly as he never met him except at the school, where there were so many others also to claim his attention. So now he approached James to make amends; but Jim was in his mind, and his first remark was, "Do you know Jim?"

"Which Jim?" said James, as though there were a great many Jims, and some of them were disreputable fellows.

"Jim that runs the fan in the east gangway of the Ebony", replied Mr. Morley, adding, as he saw that James hesitated, "Perhaps you don't like him, but you would if you knew him better. He's very sociable with his friends".

"Rats", said James and continued with great deliberation and propriety of pronunciation, as if he were determined to impress his superior education upon Mr. Morley's mind. "No, sir: I do not think that I like him altogether."

The superintendent turned away completely disgusted. "What a prig that boy is!" he said to himself. "He has been praised too much. I wish I had him down in the mine a while. I would rub him well with coal-dust, and take a little of the Pharisee out of him!"

All that day there were no signs of Jim. But the next day, when Mr. Morley entered the east gangway he heard from afar the sound of the fan, and knew that Jim was at his post. Determined to show his displeasure at the broken promise, he walked by without stopping; but all the satisfaction he got was in hearing an unmistakable chuckle from Jim. That vexed him still more; and he walked on, resolved not to turn back. But suddenly Jim called sharply to him:—

"Mr. Morley! don't go into the workings at the end of the gangway!"

He had to turn at this in spite of himself. Jim was evidently in earnest. "Why not?" he asked.

"It ain't safe", returned Jim eagerly. "The rats all came out of there this morning. There'll be a fail of coal before long, and maybe a rush of fire-damp."

The superintendent stood a moment, thinking. "I must go there and see for myself", he said, "whether there is any danger. But I will get my safety-lamp, and then go around by the upper gangway and so down into the old works.—See here, young man, what did you mean by breaking your promise?"

But Jim would give no answer, except, "Don't go in there, Mr. Morley!"

"Nonsense", said the superintendent. "I must do my duty. And when I come back I will make you tell me why you broke your promise." And with that he returned the way he came, ascended to the surface, prepared his safety-lamp, and descended once more into the mine. But he did not pass Jim's post.

An hour elapsed, and all went on as usual. Jim lay on his board, treading away at his fan; but he was restless and anxious, listening and watching. Several times he whistled for his rats, counted them, studied them, studied their manner, and peered about to see if any strangers were among them. But the last time he sounded his call the rats were gone. Only faithful old Abraham Lincoln responded; and he appeared to be divided in mind between affection and the desire to fly. "No, you don't!" quoth Jim, and, seizing the venerable sage, popped him into his pocket.

Then suddenly there came a terrible crash in the distance, as of falling rocks; and after it an explosion still more terrible; and after the explosion a rush of wind. The lights were blown out; and the men hurried in the darkness to the shaft. Quick! lest the choke-damp overtake us! In the shaft, fortunately, there was pure air still descending. So in the darkness they climbed to the top, and gathered at last all safe and thankful.

But presently some one cried out, "Where is Mr. Morley?" They all looked at one another in consternation. The crowd of women that had been wailing, and then rejoicing, as their husbands and brothers and

sons came up safe, now began to mourn anew, wringing their hands for the brave young engineer. There were rapid questions: "Who saw him last? Where did he go?" and, as it became clear to all that Mr. Morley was yet in the mine, the faces of all the men grew stern. There was no lack of volunteers. Even the women made no objections, but waited for the men to choose who should descend into the shadow of death. Four of the best miners were swiftly chosen, and as many more prepared to follow them if necessary.

Silently the party disappeared down the shaft, being lowered in a car by the engine. After a dreadful half-hour of suspense, the signal was given from below, and the car was hoisted again. Only the four men were in it. They had found the gangway crushed together so that they could not penetrate into the part of the mine where they might expect to discover Mr. Morley. And the stifling after-damp, which the big fan on the surface was sucking out of the mine, told too plainly that when they should find him he would be past help.

But the boy Jim was here an hour ago. Where is he now? Long before even the first descent of the miners, Jim had disappeared. Running with all his might down the hill, he reached the mouth of the old tunnel. The air was drawing inward. "Thank God!" cried Jim, and lifting his lamp pushed boldly into the silent, lonesome darkness, hurrying through mud and water, until he came to the place where the whole of the tunnel was filled by a great water-tank and dam built up to the very roof. "There must be some way around", he muttered in his perplexity. "The air gets through, and the rats—Ho!" he shouted with a sudden inspiration, as he jerked Abraham Lincoln out of the pocket where that old fellow had been comfortably snoozing through all the tumult, "Now I'll get it out of you!" He tied the rat's forefeet together, set him down, and watched his movements closely. Abraham hobbled back a few yards, and stopped at the foot of a post which he could not climb with his fettered feet. It bore the scratches of many a former scrambling rat. Jim looked up, and saw the dim opening of an old air-way. That was enough. With a wild hurrah he clambered up, and, crawling through a narrow passage, then a second and a third, found himself at last in the old workings near the scene of the explosion. He paused a moment to recall what he had learned of the dangerous gases among which he would have to move. The current of fresh air which had accompanied him so far was almost spent here. Ahead of him were probably masses of the deadly after-damp. Around his feet he could already notice a shimmering reflection, as if from some kind of water, thinner than common water. "It is the black-damp", he said to himself; "I must move softly, and not stir it up. As for the fire-damp, I must take my chance of that. It was probably burnt up by the explosion. But I'll keep my head and my light low down. *'For if you want to get good air, look in the middle of the gangway'.*"

The finest poetry that ever was written would not have been so appropriate to the occasion. Swiftly and silently Jim went forward on his forlorn hope. Once he called aloud, but heard no answer. The air was growing worse; his lamp grew dimmer and dimmer. At last it went out; but, while the wick was still a glimmering coal, he flung the lamp forward as far as he could, and by this means got a last glimpse of the way before him. The lamp fell to the ground, and was extinguished by the black-damp. But Jim shouted a glad hurrah; for he had seen, just at that last instant, the form of the man he had come to save. In another minute he was at the spot, and felt in the darkness the face of the superintendent. He was not dead: he moved slightly. "Sitting up!" said Jim admiringly. "That's just saved his life. He got all the good air there was!" But there was no time to lose; for the good air was scarce, and not very good either. Jim put the arms of the unconscious superintendent around his neck, and bending forward, so that both their faces should be kept in that precious layer of air, carried his burden pick-a-back through the darkness, with a step as sure as if it were daylight. "I *would* be a fool", thought he, "if I couldn't get out the way I got in!"

It was not easy getting down to the tunnel; but the air was growing better, and Jim's courage revived with it. As he lowered Mr. Morley in the soft muddy bottom of the tunnel, and followed after him, he felt a friendly nibble at his leg. Abraham Lincoln had been clean forgotten. "But I'll never forget you again, old fellow!" said Jim, as he pocketed his faithful guide. "You told me what you knew; and it was worth knowing!"

Thus it came to pass, that, just as the group of despairing people at the mouth of the shaft received the report of their exploring party, they saw a handkerchief waving away down at the foot of the hill. (N.B. It was Mr. Morley's handkerchief. Jim didn't carry such an article working days.) And when the first eager runners reached the spot they found Jim, fainted dead away across the unconscious body of the superintendent, and a hoary old rat, with his front paws tied together, sitting on Jim, and contemplating the scene with much perplexity.

Strange to say, Mr. Morley got well first. In a day or two he was about again, as strong as ever. But Jim had gone through so much excitement and exertion that the doctor kept him in bed for a long time. So it happened that Mr. Morley, whose first walk out of doors was to visit the boy who had so bravely and skilfully saved his life, found Jim at home and in bed. On the coverlet before him lies the book which the superintendent of the mine gave to Jim, and also—why, what does this mean?—The Testament which the superintendent of the Sunday-school gave to James! And, more astonishing still, there is James smiling from the pillow! So Jim was James, and James was Jim, all the time!

"I hope you'll forgive me, Mr. Morley", says he. "I began it in fun,

you see, because you didn't know me apart! But I never meant to keep it up so long—only at last I got afraid to tell you. And you know now why I said I didn't want no Testament—because I had one already!"

"My two Christmas gifts have indeed come back to me", says the superintendent.

"Yes, sir", replies James. "If it hadn't been for both of 'em I couldn't have done it. You see, I learned out of this one just how to act, and all the reasons for it, and"—

"And out of this one you learned?" asks the superintendent, putting his hand on the Testament.

Jim stretches out his feeble arms, and throws them about Mark Morley's neck, and this is what he whispers:

"Greater love hath no man than this, that a man lay down his life for his friend!"

JOB ON MINING

By R. W. RAYMOND

¹ The article entitled 'The First Writer on Mines', published in the 'Mining and Scientific Press' of March 10, is so highly ingenious and interesting as to warrant, perhaps, the suggestion of a somewhat different view, at which I arrived many years ago, as a result of a careful study of the text with the aid of the leading Hebrew scholar of this country—himself a member of the international committee which made the 'revised version' of the Old Testament.

The Book of Job, though dramatic in form, presents almost no action; and its artificial dialogue, in which each speaker takes his turn, is largely used as a thread upon which separate poems are strung. This is a well-known fashion in Oriental literature. The 'Arabian Nights' is one of numerous examples.

In Job these poems are often competitive—that is, Job produces a poem surpassing in sublimity those which have been recited by his interlocutors. The twenty-eighth chapter is such a competitive poem, the subject being 'Wisdom'. There is no good reason for the notion that the passages in this chapter, which refer to mining, are fragments of a longer document. The author is not undertaking to give a complete account of mining. He is simply illustrating the difficulty of discovering wisdom through mere search for it, by reference to the laborious search of the miner for gold and silver. Incidentally, he sketches for this purpose the two principal branches of mining, operated respectively on the surface and underground—his moral being that, while men take so much pains to discover and win valuable metals, 'Wisdom' cannot be found in that way. Additional particulars about mining were not necessary for that purpose; and their absence is evidence of the poet's artistic self-restraint, rather than of the fragmentary nature of the text as we have it. Indeed, the structure of the text almost precludes the hypothesis that it is incomplete.

In my present statement, the theological and philosophical bearings of Job's argument are intentionally ignored, and this poem on Wisdom is considered simply with regard to its direct descriptions or implications concerning the mining of the period when the work was written.

Correctly translated, and paraphrased in modern prose, the chapter reads as follows:

1. *Underground mining* (Described in the first eight verses).—Silver,

¹ From the 'Mining and Scientific Press', April 7, 1906.

gold needing to be refined (as distinguished from 'fine gold' or placer gold, which needed no subsequent treatment), iron ores and brass ores are won underground. The miner presses to the very boundary of the darkness, and searches, to that limit, the rocks as dark as death. Down and away from human abodes he sinks his shaft, in which, forgotten by the feet that pass overhead, he swings suspended. Above him, the earth produces food; but underground, ploughed by fire, it has gems for grain, and gold for clods in the soil. His trail is invisible even to the keen-eyed birds of prey; nor has it ever been traveled by prowling beasts—even the bold lion, who goes fearlessly everywhere.

2. *Surface mining.* (Described in the following three verses).—Again, the miner attacks the hard rock, overturning even the mountains by the roots, and cutting new channels, to lay bare the river-beds, in which his eye discovers every precious particle. He prevents the streams from leaking, and he brings forth the hidden treasure.

The rest of the poem declares that Wisdom can neither be won, as wealth is won by mining, nor even purchased with the products of human enterprise. The list of such things as cannot buy Wisdom comprises: Gold; silver; gold of Ophir (apparently placer gold of very high grade, possessing a special value); precious onyx and sapphire; gold wrought into cups; cups of crystal, ornamented with gold or coral; pearls; and Ethiopian topaz. Finally, it is declared that the price of Wisdom cannot be "weighed with" (or valued with) pure gold; that is, it has no legal-tender standard of value.

The particular gems, especially the ruby, named in the King James version, must be accepted with some hesitation. The revisers suggest, instead of 'ruby', either 'red coral' or 'pearls'. Corals and pearls are quite appropriate to the poet's purpose, since they may be considered as the products of a sort of mining in the sea. Sapphires may also have been found in alluvial deposits then, as they have been found in the Montana placers. And it is not impossible that they might have been discovered in veins underground, as in the Jenks corundum mine of North Carolina. But it is highly improbable that this was then an important source of supply for them.

The foregoing paraphrase is justified in the main by either the text or the margin of the 'revised version'. Where it differs from both, it is based upon good authority. The chief defect of the King James version which it corrects is the absurd rendering of verse 4: "The flood breaketh out from the inhabitant; *even the waters* forgotten of the foot; they are dried up; they are gone away from men". This totally destroys the meaning and continuity of the poet's description, which the revised version measurably restores. But both versions miss the magnificent contrast between the farmer's crops above and the agriculture of the miner below.

From the translation given above it appears:

1. That the author recognized the difference between underground and surface mining.
2. That gold, silver, iron, and 'brass' were obtained in his day by mining, followed by metallurgical treatment—doubtless a simple reduction by fusion with carbon.
3. That the relatively superior fineness of placer gold was well known, and, consequently, that no 'refining' of gold, as it occurs in nature alloyed with silver, was practised. The 'refining' of other gold was probably only a crude fusion of minerals containing free gold.
4. That underground mining was done by sinking shafts, in which the miners were suspended by ropes, and by running drifts "to the boundary of the darkness".
5. That the fracture and enrichment of the rocks underground were ascribed to volcanic causes, with the action of which, on the surface, men were familiar. This, however, is not a scientific perception, deduction, or prevision. It is simply a natural superstition.
6. That surface mining had gone so far as to involve the diversion of streams into artificial channels, for the purpose of 'bar-mining'. Possibly verse 11 may indicate the employment of coher-dams, to lay bare single auriferous bars, without diverting the whole stream. The whole description indicates the well-known capacity of the ancients for bestowing immense labor upon the execution of crude methods.
7. That coral, pearls, and sundry gems not to be positively identified, were recognized as objects of industry and commerce, and that their market value, as well as that of gold itself, was increased by the artistic work of lapidaries and jewelers.
8. That the commerce in such products was international, so that Ophir and Ethiopia were already trade-mark, indicating special quality and price.
9. That rock-crystal (not, in my judgment, glass, though this rendering is preferred by the revisers) was used in artistic jewelers' work, being carved and then adorned with coral, gold, etc. This is not evidence of an advanced state of the metallurgical art. Whatever could be done by simple patience and manual skill has been repeatedly done by primitive tribes, ignorant of the principles of the mechanical arts; and many achievements of such barbaric artificers have been simply the lucky outcome of experiments, involving a vast amount of unlucky and, therefore, rejected results. Numerous instances of ancient art, offered as proof that the early peoples knew in some respects as much, and in other respects more, than we do, break down under this test. The modern art involves a knowledge of conditions and means, and consequent ability, to accomplish with certainty the end desired. In other words, its perfection is measured, in inverse proportion, by the number of 'rejections' which it

incurs in practice. Thus estimated, I am convinced that the 'lost arts' of antiquity, concerning which so much has been rhetorically said, are not worth finding.

Further than I have gone in the above deductions, I do not think it safe to go. But another highly important question remains. Whatever may be fairly shown as to the existing state of mining and other arts by the twenty-eighth chapter of the Book of Job, what is the historic period thus illustrated?

Unquestionably, this book depicts a very ancient, patriarchal age. Yet it is almost equally certain that its theme, argument, and literary art belong to a much later age. Without discussing the problem in detail, I may here observe that the most reasonable solution appears to leading scholars and critics to be that the drama was written at least as late as 750 B.C., though it describes the social conditions of a much earlier period. Its high literary art and structure favor this hypothesis, which is, *per se*, by no means unreasonable. Historians and poets habitually describe scenes and characters of ages long before their own. Nobody dreams that Homer was a contemporary of Achilles or Ulysses, or that the Bible story of Abraham was written in Abraham's time. There is, therefore, no inherent improbability in the notion that the author of Job clothed his relatively modern didactic message in the drapery of a patriarchal age, long past.

Such a literary artifice, however, cannot possess first-hand archæological authority. We do not adduce 'The Idyls of the King' as direct evidence of the customs of the period of the Round Table. We can only accept such works as second-hand authorities, valuable in proportion to the learning and care exhibited by their authors. The best of them are not wholly free from anachronisms. Even Thackeray's 'Esmond' is said to contain one word not used at the time of which it gives an otherwise perfect picture.

This test, applied to the Book of Job, reveals very few possible anachronisms—and most of these are doubtful. Its chief anachronism is international—namely, it places in the setting of a patriarchal age the discussion of problems which did not trouble the patriarchs; and it includes in this discussion conceptions and suggestions which belong to a much later and more complex state of society. But, aside from this pervading feature, it presents a wonderfully consistent and probable picture, in which, with our present critical apparatus, we can find almost no flaws.

Among these possible errors of the historical imagination, however, we must recognize the picture of mining, metallurgy, arts, and commerce, given in the twenty-eighth chapter. In most other respects, the age of Job seems to be conceived as older, even, than the age of Abraham; and since we now know, through the code of Hammurabi, that in the time of

Abraham (say, 2500 B.C.) there was a settled and complex system of industry and law, we cannot positively declare that the poet's age of Job might not fairly present the features under consideration.

Nevertheless (for reasons that cannot be fully stated here), these features must be regarded as inconsistent, to some extent, with the extremely simple, nomadic civilization otherwise set forth, in great fullness of detail, by the Book of Job. At all events, we cannot, with positive certainty, regard this book as authority for any period earlier than, say, 750 B.C. For that period it simply adds some picturesque details to what we know already about the arts and commerce of the time of Solomon, 250 years earlier. Whether the author of 'Job' was, or was not, correct in putting these descriptions into his poetic reconstruction of a distant antiquity, he cannot be fairly regarded as the "first writer" on mining.

LAWYERS AND EXPERTS

¹ There was a man who had grown old
In digging prospect holes for gold.
Right often in his pilgrimage
He dreamed he had the long-sought ledge;
Yet every time, with spirit saddened,
He was obliged to own he "haddened",
And every time he cried, "You bet
I'll hustle on and find her yet!"

At last he struck it; staked a claim;
Laid out a townsite round the same;
Sunk, drifted, stoped and crushed away,
And showed the thing would surely pay.
Fondly he thought that nevermore
He would be luckless as before.
Alas, his troubles were not ore!

One dismal day his happy labor
Was interrupted by a neighbor,
Who coolly told him doubts had risen
Whether the ledge was "his" or "his'n",
And challenged him, without excuse,
His legal "apex" to produce.
"Apex! What's that?" he cried in woe.
"I cannot tell you", said his foe,
"But I presume the lawyers know.
And this much I can say is true:
Without it, all is up with you;
Nor is the apex all. You see,
You must have 'continuity',
And side and end lines, suited quite
To fit your 'extralateral right';
And it is further understood
A tunnel in the neighborhood
Will make your title far from good.
Then, other lodes may make connection,
Taking the space of intersection,
Or even unite with yours, and so
Gobble whatever is below.
Sure, many such things may combine
To make your mine not yours, but mine.
If you don't buy me, fear the worst!"

¹ Lines read in response to the toast, 'Lawyers and Experts', at the banquet given to the American Institute of Mining Engineers, at San Francisco, on September 27, 1899.

That miner eloquently cursed,
And said, "I'll see you—elsewhere first".

Thus was begun the famous case
That filled the journals of the place,
And thither called a mighty host
From all the wide Pacific coast—
A dozen lawyers on a side,
And eminent experts multiplied;
Maps of the biggest and the best,
And models till you couldn't rest;
Samples of rock and vein formation,
And assays showing "mineralization",
And theories of that or this,
And revelations of "genesis",
And summings-up of sound and fury
Poured out upon the judge and jury.
No matter now which party lost—
It took the mine to pay the cost;
And all the famous fight who saw
Beheld, with mingled pride and awe,
What science breeds when crossed with law.